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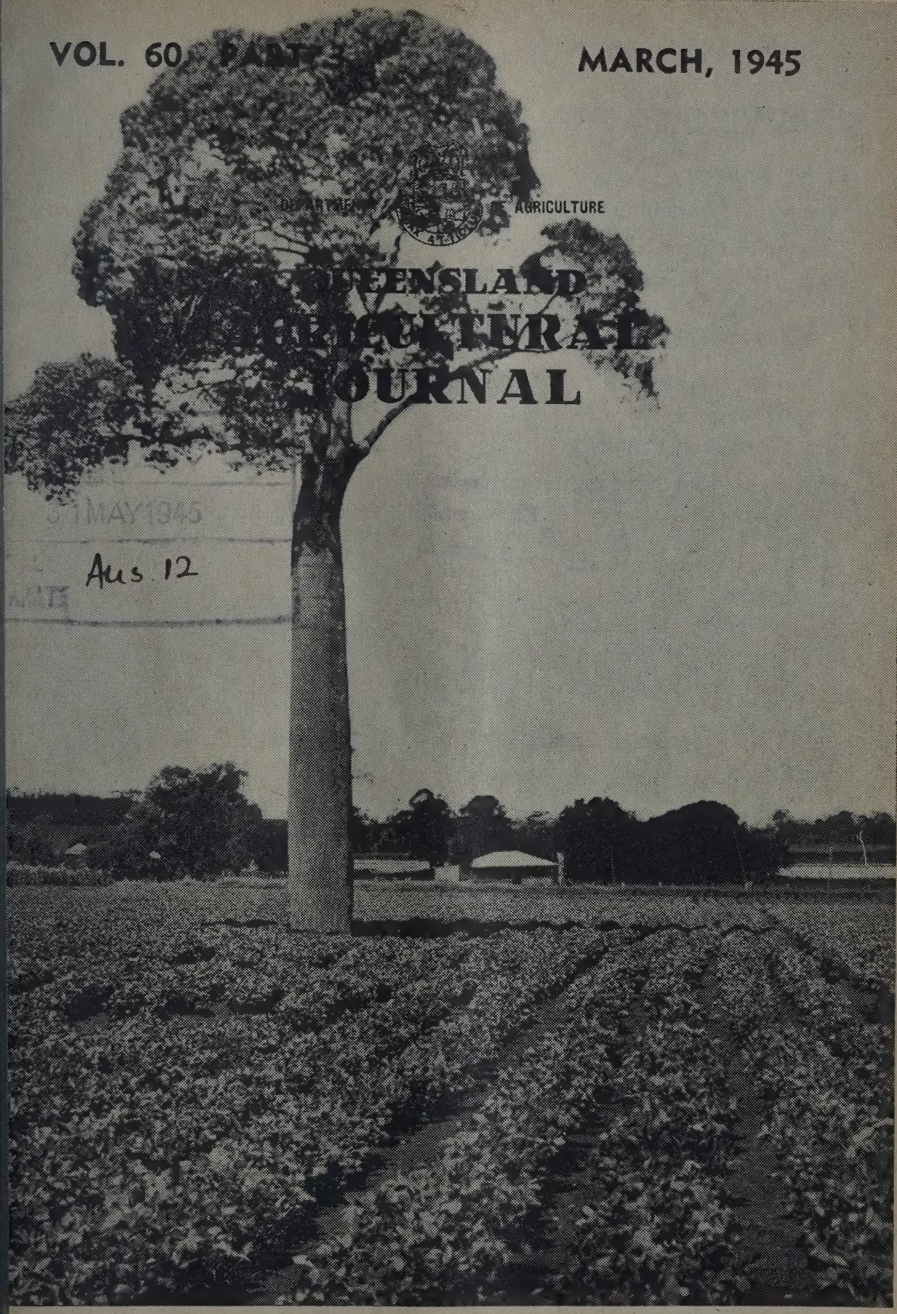

A Peanut Crop near Kingaroy.

LEADING FEATURES

Navy Bean Production
Banana Culture
Oat Grass or Onion Couch
Bean Pests
Grading-up the Dairy Herd
Feeding Brood Sows
Dressing Poultry
Rationing Meat Meals and Offals

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Volume 60 Part 3

QUEENSLAND AGRICULTURAL JOURNAL

Edited by
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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Cow is the Unit of Profit.

ON a dairy farm, the cow, not the herd, is the unit of profit. There are many convincing reasons why the milking records of dairy cows should be kept. Milking records are a guide for the feeding of each cow according to the quantity of milk she gives; the keeping of them adds to the owner's interest in every cow in his milking herd, and leads on to better feeding and breeding. The weighing of feed and milk keeps the dairy farmer informed of the daily condition of every cow, and thus he is able to observe and diagnose any oncoming ailment in his herd and prevent, perhaps, the development of deadly disease. A healthy herd is a high-producing herd. Milking records, too, form the only basis on which a herd can be improved, indicating the value of satisfactory performance in the milking shed. In fact, milking records alone will often sell cows when no other quality will, so a production card may be the best selling point as well as the best talking point. Another point is that the saleyard value of grade cows with good test figures may be very much greater than that of cows without a milking record.

In building up a dairy herd, the first thing to be done, then, is to establish a system of milk recording. The farmer is in the dairy business to make it pay, not only in the bucket but also in the stock market. Young stock may sometimes be bought on the brand, but more frequently on the milking records of the animals' parentage on both sides. Low producing cows in a dairy herd should be ruthlessly culled, for their heifers also are usually unprofitable. The heifer without a

record is on the same footing as a scrub bull without a pedigree. However, the only pedigree which really counts is something more than an entry in a herd book, it is the record of daily performance in the milking bail.

Then, there is the human element which comes into dairy farming probably more than in most other industries. Cows are highly-organised, sensitive creatures and respond well to good treatment. So the keeping of milking records leads on to better milking and the more careful handling of dairy cows. The scales act as a check on the people who do the milking and induce them to milk more thoroughly than, perhaps, they would do if the milk from each cow were not weighed. Knowing what each individual cow can do, and weighing her output every day, naturally develops personal pride and interest in a dairy herd.

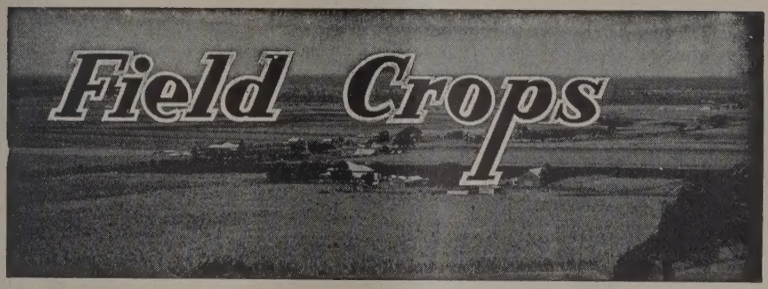
Another point in favour of testing is that with fewer better cows giving the same production as a larger number of inferior cows, the food supply is more efficiently utilised. It takes half the food a cow eats to keep her going, while the other half goes to the making of milk. If, then, thirty good cows give as much milk as forty cows which are not so good, it will be seen that the food which would otherwise be eaten by the ten culled cows becomes available for increased production of milk by the remainder of the herd. Again, with fewer cows of higher quality, the possibility of disease in the herd is obviously proportionately reduced.

The keeping of records therefore is of great importance in dairy farm economy, but apart from the pounds, shillings and pence aspect of the business, proper milk recording means more milk in the bucket, and greater dairy production is one of the urgent needs of Australia to-day.

Other Factors in Farm Management.

PROPERLY used, animal manure rapidly improves the growth of grass, that is why its systematic use is advocated and sound pasture management is a fundamental factor in profitable dairying.

Many dairy farmers are not satisfied with the growth of fodder crops and pastures on their farms, otherwise dairy advisors would not be called on so frequently to answer questions bearing on soil fertility and productivity, the rapid running out of grasses during dry spells, and the increasing difficulty of maintaining swards of nutritious pasture plants. To most questions a common answer may be given, and that answer is that most of the soils in old-established dairy lands have been allowed to deteriorate in fertility, particularly in respect of their content of organic matter. Through continuous cropping and grazing, supplies of readily available mineral plant foods eventually become exhausted. With the depletion of humus, soils lose to a great extent their capacity to absorb and retain moisture. To get both grass and crop land back into a highly productive condition, it is advisable to practice a sound system of rotation, including the growing of green manure crops and top dressing of pastures. Among the right methods of pasture improvement is the systematic and effective application of farmyard manure, the cheapest of available fertilizers and one which should be more widely appreciated as a factor in grassland economy.



Navy Bean Production in Queensland.

J. A. KERR, Instructor in Agriculture.

THE profitable production of navy beans and other varieties of canning beans commenced in the 1941-42 season should lead to the planting of increased acreages by experienced growers, and also interest other farmers in districts where soil and seasonal conditions are suitable. The dried mature plants are harvested, and the seed used for human consumption, generally in a canned form.

Relatively low production costs, because of complete mechanical harvesting and threshing, offer an inducement for the establishment of large individual areas, while the high net return per acre makes the crop also suitable for smaller growers.

The canning bean is a summer crop, maturing in from 70-110 days, according to variety, and as it is susceptible to frost injury, suitable planting times will safely extend from the first frost-free months in the district concerned up to the end of January. The most favoured planting period will vary in different districts, but late December to the end of January is recommended in the South Burnett. January planting should result in crops maturing during April, when harvesting weather is expected to be favourable. Moreover, January planting should conveniently fit in with other farm crop operations, permitting the previous completion of planting and first cultivation of most other summer row crops. Earlier plantings are usually preferred on the eastern Darling Downs.

Susceptibility to Bean Fly Attack.

In areas subject to attack by bean fly, early planting is usually recommended, but in districts such as the South Burnett, where other related bean crops are not extensively grown, early planting, by increasing the bean fly population, tends to increase the risk of damage by fly to the main plantings later in the season. It is, therefore, suggested that avoidance of early planting in districts similar to the South Burnett would be generally beneficial.

Varieties.

Of the varieties planted in Queensland in the last few years, Navy, California Small White, Pinto, and Great Northern are the most promising. Pinto is an early maturing variety (approximately ten weeks), producing a large, coloured seed.

Navy matures in approximately twelve to fourteen weeks, while Californian Small White takes a week or two longer. Ohtenashi and Asada Pearl shatter freely and therefore are not recommended.

Soils.

Friable, well-drained soils of average fertility will grow good beans. Poorly-drained soils, notwithstanding other suitable characteristics, should not, as a rule, be planted. High yields have been obtained from soils varying from sandy loams to chocolate types, including a large range of red loams, but planting on poor soils is not recommended. On the Darling Downs, the heavy black soils have not proved so suitable for beans as the lighter loams and scrub soils. The application of superphosphate at the rate of 1-2 cwt. to the acre should prove beneficial in increasing yields and inducing a more even ripening of the crop. Immediate contact of the seed with the fertilizer in the seed bed should be avoided, otherwise faulty germination may result.

Soil preparation for beans should be in accordance with normal cultural methods designed to conserve moisture, check weed growth, and produce a medium fine seed bed. Early ploughing following a suitable rotational crop is, naturally, highly beneficial. Inoculation of seed with a suitable culture may be beneficial.

Planting.

Planting may be completed with a maize planter, or by the use of an ordinary grain drill with most grain runs blocked.

Actual row spacing will generally vary from 28 inches to 36 inches, the wider spacing being necessary on rich rain forest soils, because of the prolific foliage developed on these soils. Seed should be planted from 2 inches to 3 inches deep, the shallower plantings being advisable for heavy soils. Plant spacing in the row should average about 3 inches.

The rate of planting will vary according to variety and spacing. Small-seeded varieties at the wider row spacing may require 12-15 lb. to the acre, while larger seeded varieties such as Pinto require up to double that quantity of seed.

Plate 50.
A TWO-ROW BEAN CUTTER.

Cultivation.

The amount of cultivation required after planting will vary according to soil and seasonal conditions, but clean cultivation improves yields and simplifies harvesting. Late-planted crops will generally require less cleaning than early-planted crops.

Harvesting.

The required stage of maturity of the bean plant when harvesting will depend on the harvesting methods practised. Where suitable harvesting machinery is not available, the beans may be pulled by hand when most of the beans are at least beyond the yellow stage, with a few becoming brittle.

The beans will require further drying in the field, and may then be removed to storage sheds, or be threshed in the field. Threshing of such crops may be completed in the field with a header-harvester, fitted with a pick-up attachment, or the crop may be conveyed to stationary threshing machines. Where mechanical threshers are not available, tramping with horses or rolling will give satisfactory results.

The best harvesting methods for large areas, particularly where labour is limited, are:—

(1) Cutting with either the Robey bean cutter fitted to tractors, or the Harvey bean cutter drawn by horses. The bean cutters cut two rows and direct them to a central windrow. Cutters are available on hire in South Burnett and Darling Downs bean growing districts, at a nominal charge per acre, from the Queensland Government machinery pool. When dried to a brittle stage in the field after cutting, the beans are ready for threshing.

(2) Threshing with a header-harvester fitted with a pick-up attachment. Where the latter method of threshing is used it is recommended that the beans be permitted to reach an advanced stage of maturity, with most of the beans in a brittle stage before using the cutter.

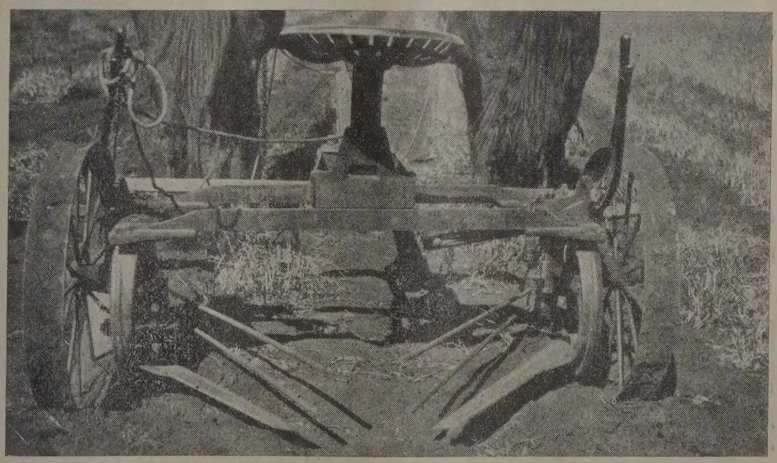


Plate 51.

A Close-up View of a Two-row Bean Cutter, showing Cutting Blades and Guide Rods for Placing Bean Plants into a Single Windrow.

Canning beans of the varieties recommended do not shatter freely, nor readily weather-stain, although the pods may blacken during continuous wet weather. Long periods of unfavourable harvesting weather have resulted in little damage to beans in the field, provided the crop has not been cut or pulled. Most damage from mould or germination of seed occurs in pods in contact with the soil.

Marketing.

At the present time canning beans of the Navy and other varieties are grown entirely under contract to the Commonwealth Department of Commerce and Agriculture, Brisbane, payments to farmers being made according to grade or percentage of sound beans suitable for canning.

The Queensland Department of Agriculture and Stock co-operates with the Commonwealth Department in arranging contracts, and also assists growers to obtain maximum production from their land. Efforts to produce high quality beans will be rewarded by higher cash returns per acre.

Acreage yields will naturally vary considerably, but with present contract prices average net returns per acre should be from £12 to £15 per acre with higher returns probable during favourable seasons.

Because of the importance of canning beans as a wartime crop, farmers are urged to plant increased acreages for a guaranteed market, with resultant benefit to Australia's food store and profit to the producer.

INFORMATIONAL AND ADVISORY SERVICES.

Information and advice on matters relating to primary production may be obtained from the Department of Agriculture and Stock, William Street, Brisbane, B. 7, or from appropriate officers in country centres. The following list shows where Departmental advisory officers are stationed:—

GENERAL AGRICULTURAL CROPS AND PASTURES: Brisbane (Tel. B 1541); Toowoomba; Chinchilla; Warwick; Laidley; Boonah; Kingaroy; Bundaberg (Court House); Monto; Rockhampton (cnr. Bolsover and Fitzroy Streets); Mackay (Court House); Ayr; Home Hill; South Johnstone (Bureau of Tropical Agriculture); Atherton; and Mareeba.

COTTON: Brisbane (Tel. B 1541); Dalby; Kingaroy; Gayndah (Court House); Monto; Biloela (Cotton Research Station); Home Hill; Ayr. All advisors on general agriculture also deal with cotton culture.

SUGAR-CANE: Brisbane (Tel. B 1541); Bundaberg (Sugar Experiment Station, Tel. 228); Mackay (Sugar Experiment Station, Te Kowai, Tel. 17); Innisfail (Tel. 271); Meringa (Sugar Experiment Station, Tel. Gordonvale 95); Cairns (Tel. 2589).

FRUIT AND VEGETABLES: Brisbane (Tel. B 1541); Coolangatta; Southport; Toowoomba; Warwick; Stanthorpe; Wallangarra; Dayboro; Nambour (Field Station, Tel. 175); Gympie; Gayndah (Court House); Rockhampton; Bowen; Townsville; and Cairns.

Advice on vegetable-growing is obtainable also from general agricultural advisory officers.

INSECT PESTS: Specialist Officers at Brisbane (Tel. B 1541); Gayndah (Court House); Rockhampton (cnr. Bolsover and Fitzroy Streets), Townsville.

PLANT DISEASES: Specialist Officers at Brisbane (Tel. B 1541) and Toowoomba (Long Street, Tel. 1990).

IDENTIFICATION OF PLANTS: Brisbane (Botanic Museum and Herbarium, Botanic Gardens, Tel. B 8243).

BEEKEEPING: Brisbane (Tel. B 1541).

SEED-TESTING: Brisbane (Tel. B 1541).

SHEEP AND WOOL: Brisbane (Tel. B 1541); Blackall.

DAIRYING AND CATTLE-RAISING: Officers of the Dairy and Stock Branches are stationed in a large number of country towns.

PIG-RAISING: Brisbane (Tel. B 1541).

POULTRY-RAISING: Brisbane (Tel. B 1541); Boonah (Stock Office).

VETERINARY SERVICES: Brisbane (Tel. B 1541); Yeerongpilly (Animal Health Station, Tel. JY 8005); Toowoomba (Tel. 547); Murgon; Rockhampton; Clermont; Townsville (Animal Health Station, Oonoonba, Tel. Townsville 484); Atherton.

Banana Culture in Tropical Queensland.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

DURING the early years of the present century banana-growing was an extensive industry in North Queensland, several ships running regularly each week for the conveyance of the fruit from northern centres to the markets of Brisbane, Sydney, Melbourne, and occasionally as far as Perth. Exports from the port of Cairns alone in 1902 amounted to 392,000 bunches and production was on a similar scale in other districts of the North. In those days the industry was almost entirely in the hands of Chinese growers. Good land was plentiful, consequently no efforts were made to establish permanent plantations: as soon as deterioration of a plot commenced it was abandoned and a new area cleared and planted. Gradually, through a number of contributory causes, banana-growing as a major industry eventually passed from the North to the areas of southern Queensland and northern New South Wales. However, there are indications that the industry is again returning to North Queensland, and the time may be not far distant when the banana will be once again an important crop.

The banana family contains a large number of species scattered over various parts of the world, and includes three native to North Queensland, namely *Musa Banksii*, *Musa Fitzalani*, and *Musa Hillii*, none of which, however, is edible. Various species are cultivated in different parts of the world but in Queensland only two are considered of commercial importance, viz.:—*M. cavendishii*, the dwarf type, and *M. sapientum*, which includes most of the cultivated tall varieties. A third species, *M. paradisiaca*, the plantain type, is grown only infrequently.

A study of the growing habits of the banana indicates that only the most favourable conditions of soil and climate are able to maintain the vigorous growth of such a rampant plant. Even amongst tropical vegetation few plants equal its growth rate. The wet tropical areas throughout the world have been found to offer the most favourable conditions for such rapid development, hence it is reasonable to expect that such areas in North Queensland will be equally suitable for the re-establishment of the banana industry.

To most people of the South banana plantations and steep hillsides are inseparable. The establishment of plantations in such situations is necessary in South Queensland to escape frosts. In the coastal area of North Queensland the almost complete absence of frost renders such

precautions unnecessary, and other factors, such as soil erosion under torrential tropical rainfall, render hillside planting quite impracticable. The ideal sites here are the flat lands of the coastal plain, preferably those areas adjacent to one of the many watercourses. Such lands are usually composed of rich alluvium, built up during the course of centuries into soils of considerable depth. The flat land permits the greatest economy in all field operations and makes an economic possibility such cultural and pest control measures which are desirable but impracticable on hillside plantations. The combination of rich soils, tropical warmth and good moisture supply results in vigorous growth and heavy production of high-grade fruit, and in long-lived plantations. Plate 53 illustrates such a plantation now in its twelfth year of continuous cropping, and demonstrates that banana-growing under these conditions may be safely regarded as a permanent industry.

Habit of Growth.

The cultivated banana commences its cycle of growth as a bud on the corm of an old plant. The bud develops into a bulb which sends out an aerial growth of leaves surmounting a pseudostem formed by the closely sheathing leaf stems. During most of its life, the growing point of the plant is protected by these leaf stems. As growth progresses leaves are continually pushed through the centre of the pseudostem to unfurl on reaching the throat or crown of the plant. Eventually the inflorescence is pushed through the crown and, on emerging, opens to display the hands of embryo fruits each surmounted by a flower. Banana flowers are hermaphrodite or bisexual but in the first six to twelve hands femaleness predominates and these develop the fruits. The remainder are either bisexual or dominantly male and carry abortive fruits which do not develop. No further leaves are produced after the bunch, and when the fruit ripens the plant dies. In the meantime, however, buds on the corm have developed into off-shoots to carry on the succession.

Plate 52.

TYPICAL BANANA LAND OF NORTH QUEENSLAND.—Jungle lands of the Tully River under bananas prior to 1912 and since that time under grass.

Plate 53.

A Twelve-year-old Banana Plantation, Freshwater Creek, near Cairns.

Varieties.

The most widely cultivated variety and indeed the one generally giving most satisfactory commercial results in the North is the Cavendish. This is a dwarf type of prolific cropping habit. Its low stature renders it an easy type to handle in the plantation and in harvesting, and gives it some degree of immunity to wind damage. It is also resistant to Panama disease.

The various sports of the Cavendish are also profitable types under northern conditions. The most common is the Mons Marie, a variety with an open bunch, which habit renders it somewhat less susceptible to damage by the banana rust thrips than the closer bunched Cavendish.

The tall varieties—Gros Michel, Sugar, Lady Finger, and Ducasses—are grown fairly widely where conditions are suitable. On exceptionally rich soils in well sheltered localities the Gros Michel is a good variety. Under such conditions the Cavendish would, however, prove more profitable.

Sugar and Lady Finger are well known varieties in all banana-producing areas. The Ducasses is not well known, and its growth is limited to a fairly restricted area of the North. It is a robust variety similar to the Sugar, with a superior cropping habit but an inferior quality. Its chief advantage lies in the fact that it appears to be highly resistant to both rust and leaf spot.

Soils and Sites.

The banana does not normally pay to grow on unsuitable soil. Quick growth and high production are essential to success, and only a soil of the right type and of high fertility will ensure this. The ideal soil

is a well-drained, friable loam of good depth and high moisture-holding capacity. Two to three feet is the minimum depth for a soil to be classed as good, while greater depth is desirable. This type of soil is to be found on the alluvial flats and in the delta country of the numerous rivers and creeks along the coast. Such soil, having been built up by the annual overflowing of the streams, is rich in humus and accumulated plant foods, carried down by the water from higher levels, and is being continually replenished by fresh layers of silt deposited with each flood. When properly worked it is practically inexhaustible. Disadvantages attached to such locations are the fouling of the land with weed seeds deposited in the silt; and the occasional washing-up of logs across the land, with consequent damage to banana plants.

In selecting land located on the bank of a stream it is necessary to guard against areas that are subject to erosion by the current when the stream is in flood. Flooding through overflowing of the stream occurs on much of the richest banana lands in the tropical wet belt, and, providing the flood waters are neither perfectly still nor flowing strongly over the land little damage appears to be caused to the plants, providing further that the flooding is of no longer duration than a day or two, and the soil is quickly drained of excess water.

The deep volcanic loams of parts of the northern area have not yet been the subject of sufficient research in relation to banana-growing to recommend their selection for this crop. In our present state of knowledge only a very short life can be expected of a banana plantation on these volcanic soils.

Sandy soils will grow bananas only under certain special conditions and cannot be generally regarded as commercially suitable. Shallow soils overlying clay, and impervious clay soils, are ruled out on account of poor drainage.

Preparation of the Land.

If the land selected is virgin jungle, as will frequently be the case, the first operation in the establishment of the plantation will be the clearing away of the timber and undergrowth. A certain amount of skill is necessary to obtain a "fall" that will carry a good fire; therefore, if the prospective settler is inexperienced it would be advisable to have the clearing done by professional scrub fellers, under contract. Normal rates for brushing and felling in the North are approximately £3 to £4 per acre. The felling should be undertaken in the late winter so that a period of four to five months during the driest part of the year can be allowed for the timber to dry thoroughly before being burnt.

Burning off is done in late November or December, before the first storms. If the clearing has been well done, the drying period sufficiently long, and the day selected for burning off a good one, a clean burn should be the result. A "clean burn" is one in which practically all the small timber and many of the larger logs have been completely reduced to ashes. However good the burn there will nevertheless be a certain amount of logging-up and burning off necessary. On land subject to flooding this must be as thorough as possible to prevent future damage to the bananas by shifting logs. During logging operations the layout of the plantation must be considered. Tracks for carting out must be located and cleared of stumps. These tracks should be placed

sufficiently close together to minimise hand carrying. When deciding upon their spacing it is as well to remember that good average bunches of bananas weigh in the vicinity of 40-50 lb. and that they must be carried in pairs on a yoke, or singly in the hand.

If the site selected is cleared land or very lightly timbered country, such as can be immediately cleared of all trees and roots, the settler is advanced a stage further than the man who commences on jungle country, since the final objective in permanent banana-growing is ploughable land. The man selecting open country can achieve this stage from the commencement, whereas the man on jungle country only achieves it after three or four years when his scrub stumps have decayed sufficiently to make the complete clearing of the land possible. Cleared land should be well ploughed and cultivated to good tilth. If the land is old cultivation or grass land it will be necessary to grow and plough under a heavy green manure crop during the initial stage of preparation, as high humus content of the soil is essential to successful banana-growing. When the land is finally prepared, tracks, irrigation channels and any necessary surface drains are located.

Holing Out and Planting.

It is not necessary to take great pains to have banana rows perfectly aligned in every direction because the suckering habit of growth causes movement in the location of each stool. It is, however, advisable to plant the rows approximately straight in at least two directions for greater ease in carrying out all future operations. The customary methods of marking out are either to mark each row with sighter pegs and, following the line of the sighters, mark off each space in the row with a stick of the appropriate length, or to use two marker sticks of appropriate length to measure the distance of each plant from the preceding one in the same row and from its neighbour in the previously marked row.

In a good, loamy soil that has been well prepared, holing out should be possible with a shovel or spade only, but in freshly-cleared stump land, or in soil that is rather on the heavy side, the assistance of a bar to loosen the soil is frequently necessary. Holes should be opened out to 15 inches deep for dwarf varieties and 18 to 20 inches deep for tall growing bananas. The breadth of the hole need not be more than 10 to 12 inches. Soil removed in opening the hole should be scattered over the surface of the land—not left in heaps near the holes. In planting, a small quantity of loose surface soil is first broken in from the edge of the hole. The sucker is placed on top of this and the bulb is then just covered by breaking down the edges of the hole round it, and firming the soil with the feet. The plant is thus set in a shallow, saucer-shaped depression.

Sometimes more than one plant is set in each hole at planting to increase the initial crop. If this is done the holes must be opened out wider to allow a little space between the plants and at the same time give sufficient loose soil in which the young roots can make their initial growth. Multiple planting is not common practice in North Queensland.

Planting Material.

This may be of three kinds, viz.:—"butts," "bits," or suckers. A "butt" is the corm of a matured plant or one approaching maturity,

and is prepared by cutting away the plant an inch or two above the corm, and gouging out the centre and all but one or two strong eyes with a knife.

A "bit" is prepared from the same material as the butt but in this case the corm is cut into a number of sections each carrying a strong eye. Several bits may thus be obtained from a single corm. The bits should be of fair size—not less than about 1½ lb in weight—so that the eyes will develop strongly.

It is preferable to obtain bits from nearly mature plants rather than from those which have borne bunches as a greater number of strong eyes or buds are normally present on the butts of plants which have not fruited.

Plate 54.

BACK TO BANANAS.—Portion of the land shown in Plate 52 brought under the plough and replanted one month prior to photographing.

Suckers are the off-shoots from maturing plants. They are the eyes developed to the stage of individual bulbs with young aerial growth. Suckers are best taken small—when not more than 2 feet high for dwarf types or 5 feet high for tall types. Those with a large bulb and tapering top surmounted by two or three short narrow leaves should be selected, as they possess the greatest vigour. These are known as spear suckers. The type with small bulb and spindly pseudostem surmounted by several short broad leaves, known as the umbrella sucker, is not desirable as it is wanting in vigour.

The butt is not now favourably regarded on account of the prevalence of banana beetle borer, which could be unwittingly introduced into new plantations in this type of material. The bit offers much less risk because, being cut from the corm, the presence of beetle borer is easily detected. Vigorous, quickly-grown suckers are usually reasonably free from borers, but if they have been attacked the damage is either superficial or the borer tunnel enters from the parent corm. In both cases the presence of the borer can be easily discerned, and the damage pared away or the plant discarded.

In preparing the planting material, of whatever type, all roots and adhering earth must be pared away until the bulb is quite clean. It should then be carefully inspected for the presence of pest or disease.

When planting "bits," it is customary to set them in the ground with the eye facing downwards. This ensures the development of the new bulb deep down in the soil, and permits the free distribution of roots in every direction. If the bit is placed with the eye up, the new bulb is formed on top of the bit and comes very close to the surface of the ground, whilst the bit hinders the free descent of anchor roots into the soil. Planting material should be graded to type and to size, and each grade planted in a block. This makes for evenness in the plantation and consequently simplifies field operations.

Planting Distance.

Spacing of bananas in the plantation varies with the soil, the variety of banana, and the type of bunching for which it is proposed to work. Planting should be sufficiently close for reasonable shading of the soil by the grown plant, but not so close that root crowding and excessive competition results, or that cultural activities are unduly hampered. The richer the soil the more vigorous is the growth as a general rule, and the wider must be the spacing. On poorer soils the plants should be set closer. Tall-growing varieties also require wider spacing than dwarfs in the same soil.

For dwarf varieties the distance should be 10 feet by 10 feet up to 12 feet by 12 feet for single bunching, according to the growth vigour that can be expected. If the double bunching system is to be adopted slightly wider spacing must be allowed. Tall varieties should be allowed 14 feet by 14 feet up to 16 feet by 16 feet for similar types of soil.

Plants required per acre at the distances mentioned are:—

10 x 10 feet	435 plants per acre
11 x 11 feet	330 plants per acre
12 x 12 feet	300 plants per acre
14 x 14 feet	220 plants per acre
15 x 15 feet	190 plants per acre
16 x 16 feet	170 plants per acre

Shelter Breaks.

Wind causes considerable damage in banana plants by the ribboning and subsequent drying out of the leaves, by the fracture of roots, and by the abrasion of fruit. Where the site is an exposed one, therefore, as is frequently the case in wide areas like the Burdekin delta lands, provision must be made for windbreaks on the sides exposed to the prevailing winds. A hedge of vigorous, tall-growing bananas such as the Ducasses variety makes an ideal break for the Cavendish plantation. Several rows of a tall variety of sugar-cane or cow cane are almost equally effective. The object should be to select a type of plant for the break that grows only a little taller than the crop so that it neither overshadows the outer rows nor robs the plants in these rows by excessive foraging of the roots. The Ducasses banana is recommended owing to its thick stooling habit and its immunity to some pests and diseases. It is as susceptible as any other variety to fruit fly, however, so bunches must be harvested as they mature, whether or not

it is intended to market them. The shelter break should be planted at the same time as the green manure crop when preparing the land for the plantation. This permits of its development into a useful windbreak by the time the planting of the field is carried out.

Fertilizer.

The banana is a gross feeder, consequently if production is to be maintained over a period of years the soil must be regularly built up with fertilizers. As long ago as 1912 experiments carried out by the Department of Agriculture at Buderim, demonstrated how old land could be again brought under profitable production of bananas by the application of fertilizer. The experiments supported results obtained

Plate 55.

ANOTHER OLD BANANA AREA REPLANTED.—Originally growing Gros Michel variety when first cleared in 1927, now stumped and planted with Cavendish.

in other countries, which showed that fertilizer mixtures with potash in predominance were required by bananas. Recent experimental work conducted by Dr. W. A. T. Summerville, also at Buderim, has confirmed the necessity for high potash content in the fertilizer mixture, and the same work has demonstrated that the greatest benefit is obtained from the application of the fertilizer very early in the life of the plant, The experiments so far conducted have been successful with nitrogen, phosphate and potash in the proportions of approximately 1 : 1 : 2 or 1 : 2 : 4, with the total annual dressing at the rate of about 1 ton per acre. No fertilizer trials have yet been conducted in connection with bananas on the northern coastal plain, therefore, it cannot be definitely stated either what formula or what rate of application will be most profitable to use. Pending local fertilizer trials, the adoption of the grade and quantity giving best results in other places is recommended.

The first dressing should be given at or closely following planting of the suckers and should be at the rate of about 2½ lb. of mixture per stool. Subsequent dressings at the same rate should be applied as each succeeding generation of suckers commences to grow. The fertiliser should be spread in a band about 2 feet wide round the plant or stool at a distance of about a foot from the base and lightly worked into the surface soil.*

Cultivation.

A good tilth should be maintained at all times and weed growth checked in the early stages. Where stumps prevent the use of machine or horse-drawn implements the work must be done by hand with a hoe. Cultivation to the full depth of the hoe blade should be carried out at least once a year. Machine or horse-drawn implements should be used wherever possible, however, on account of both the ease and speed of working and the greater efficiency of the work done. Light disc cultivators or disc harrows will do the best work. If they tend to bury too deeply wheels should be fitted to regulate the depth, as surface working only is necessary. A very useful type of implement for this work is the small garden tractor equipped with disc harrow.

During the wet season period of the year some growers adopt the practice of spraying with arsenic pentoxide to control weed growth in plantations on stump land, but this cannot be recommended. During this period of the year weed growth should be controlled by the planting of a green cover crop—preferably a low growing legume such as Poona, Groit, clay or black cowpea. Such a crop not only controls weed growth but provides a surface cover to prevent erosion of the soil, improves the nitrogen content of the soil and builds up the humus. These peas are all short-lived plants that will die down late in the wet season, and can then be readily worked into the soil. The annual green manure crop is essential in banana land under the plough.

The green crop may be planted broadcast between the banana rows, but is better sown in drills so that weed growth may be controlled in the early stages. A light dressing of fertiliser containing nitrogen and phosphate should be used for this crop.

Irrigation.

No part of the northern area has sufficiently regular rainfall to grow bananas successfully at all times under natural rainfall conditions. Generally speaking, during the period from December to July there is a sufficiency of rainfall in the wet belt; in other parts of the north a rather shorter period will normally have a sufficiency. During the remainder of the year rainfall must be supplemented by irrigation to maintain regular growth. Flood, furrow or basin irrigation is preferable to a spray system, mainly on account of the prevalence in the North of Cercospora leaf spot which can be spread by falling and splashing water. Irrigation should be sufficiently frequent, and in such amounts as to maintain a fairly high percentage of moisture in the soil—sufficient to ensure regular and even growth. Irregular growth is most clearly evidenced in the spacing of successive leaves on the pseudostem. Any

* Owing to war-time shortage occasioning restriction on the percentage of various ingredients in fertilizer mixtures it is not at present possible to purchase fertilizer containing the recommended amount of potash The mixture with the proportions nearest to those stated should therefore be selected.

tendency to crowding of leaves at the crown of the plant indicates a slowing of growth. Under tropical conditions lack of moisture is the main cause for slowing down of growth. It is, therefore, imperative that irrigation should be sufficiently frequent and of such quantity that regular elongation of the pseudostem is maintained.

Desuckering.

If the banana plant is allowed to grow at will a considerable number of off-shoots or suckers will be produced from each plant. Such vigorous vegetative growth takes place to the detriment of fruiting, and must therefore be controlled. Desuckering should take place whilst the off-shoots are still quite small—not more than 6 inches to 12 inches high so that the minimum amount of waste growth occurs. The operation is carried out with a special banana desuckering gouge. This implement is in the style of a large, tapering, concave chisel, sharpened on both edges as well as at the point, the blade being about 15 inches long. When the suckers are quite young the gouge may be inserted between the sucker and the parent corm and the whole young plant removed without disturbing the parent. If the suckers are too large to be completely

Plate 56.

SUCKERS RUN RIOT.—Dense sucker growth that must be regularly suppressed.

removed the point of the gouge is pushed downwards into the side of the sucker at ground level, with the point directed towards the basal centre. With a circular twisting motion of the gouge the top of the sucker is then cut off and the central growing point gouged out. The removal of the growing point is important otherwise the sucker will again shoot, making it necessary to repeat the operation within a few weeks.

The first desuckering should take place early in the life of the new plantation, all suckers being removed. Suckers should be suppressed until the parent plant is about three parts grown. At this stage one or two following suckers may be permitted to grow, according to whether it is proposed to work on the single bunch or two bunch system. The suckers selected as followers should be sturdy growing spear types, set well clear of the parent plant to indicate that they have sprung from deep down and will, therefore, be well anchored. If the one bunch system is being followed the suckers should be selected on the same side of each plant as far as is possible. Selection in this manner assists in maintaining comparative evenness and straightness of the rows. Where double

Plate 57.

SUCKERS CONTROLLED.—A well desuckered stool showing parent plant with bunch mature, first ratoon nearly to bunching stage, and young spear sucker a few weeks old.

bunching is to be practised the first two followers should be on opposite sides of the parent, but as far as possible in the same relative positions on each plant. The second lot of followers can then be selected on the same side of each of the first followers. Where double planting has been practised the first pair of followers are selected on the same side of the parents in each case. The effect of this method of selection is gradually to move the whole plantation in one direction, whilst maintaining the rows in some degree of regularity, which is necessary to allow easy access for the cultivating implements.

Trimming and Propping.

These operations embrace the removal of dead leaves and attention to the bunch. When each leaf completes its function it dies, and as its

Plate 58.

THE RESULT OF NEGLECT.—A prop would have prevented this.

stem dries out, it falls pendant round the pseudostem. A number of such leaves allowed to remain in this position tends to choke the stool, suppress sucker growth, prevent ventilation, encourage vermin and promote spread of fungus. They should, therefore, be removed at intervals, preferably at the end of winter; but only dead leaves or those too damaged to function should be cut away.

When the bunch is thrown, it will, if growth conditions are reasonably favourable, be projected through the throat or crown of the plant with a sufficiently long stem to permit it to bend over and hang beneath the shelter of the leaves. As the bud opens, a bract lifts from each hand and in the course of a few days withers and becomes detached from the hand. These bracts should be removed as soon as they become loose as, if allowed to remain on the hands they provide cover for thrips, fruit eating caterpillars, and spotting bugs. The "bud" at the bottom of the bunch should also be broken off when two or three abortive hands have

been exposed. Many reasons are frequently advanced both for and against the removal of this bud, but the fact that it frequently provides harbourage for insect pests is sufficient argument in favour of its removal.

When the bunch is thrown in a normal manner the bend of the bunch stalk is protected by the last very small bract-like leaf. Occasionally, however, this leaf is on the under side of the stalk, and the bend is then exposed to the burning rays of the sun. During the summer

Plate 59.

Too Short a Prop is as bad as no Prop at all.

months a bunch stem thus exposed burns very quickly; therefore it is necessary to watch the bunches closely as they are thrown and cover any so exposed by breaking down over the bunch the last leaf thrown on the side opposite the bunch. A leaf directly behind the bunch should be chosen for shading purposes, because one so placed will remain in position and not tend to fall sideways away from the bunch when disturbed by wind.

At some periods of the year when growing conditions have been unfavourable the throwing of the bunch is abnormal. Typically such bunches are barely thrown clear of the throat and fail to reach beneath the protecting leaves. Sometimes the bunch fails to clear the throat, and expands whilst still pointing upwards; whilst in exceptionally bad cases

of choking the bunch fails to reach the crown of the plant but breaks through the side of the pseudostem. Such bunches rarely develop marketable fruit, but a bunch that manages to issue through the throat can frequently be saved by judicious removal of one or two leaves below it to ease the bunch, and then covering it above by bending one or two opposite leaves over it.

The weight of a large bunch is considerable. As has been mentioned above, average bunches weigh 40 to 50 lb., but large bunches weigh over 100 lb. Such great weight requires additional support to that rendered by the pseudostem, and for this purpose it is necessary to use props. The props should be sufficiently stout to support the weight without bending. They may be conveniently split from lengths of black bean, which is plentiful in many coastal areas of the North. This timber has a long, straight grain, is strong and easy to split, and is durable. Any other similar timber may be used, or 1½ inch square sawn timber may be procured for the purpose. Young sapling timber may be used but is not so desirable as it usually has a shorter life as a stake and is sometimes inclined to be whippy. The stakes should be of sufficient length to reach

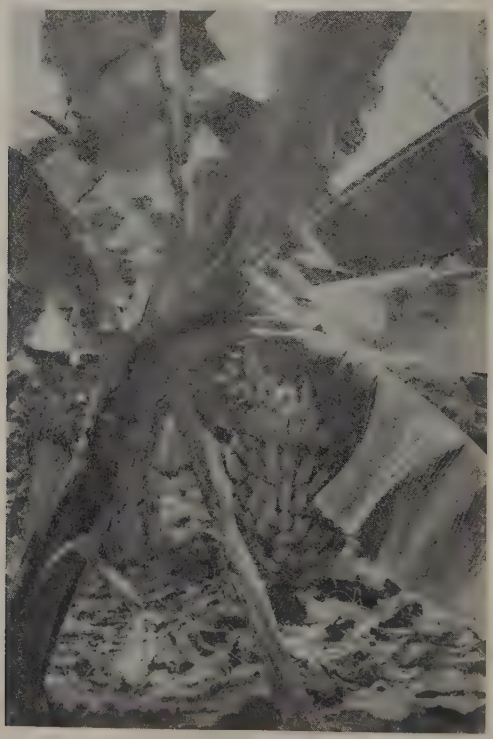


Plate 60.

THE PROPER PLACE TO INSERT THE PROP.—But the single prop employed here is injuring the bunch by rubbing.

Plate 61.

Double Propping Prevents Injury.—The plant is firmly stayed with the bunch hanging clear between the two props.

from the throat of the plant, at a wide angle, to the ground. One end should be cut to an abrupt point whilst the other end is left square. Props with a fork at one end are not necessary; indeed, the straight prop gives more secure support owing to the method of its application. Whilst the bunch is still not more than about half grown, and before it imposes too great a strain on the plant, the sharpened end of a prop is pushed into the pseudostem immediately below the throat and the other end jammed into the ground so that it supports part of the weight. It will frequently be found that a single prop must be placed in such a position that the bunch rubs against it, to the damage of several fruit. In such a case two props should be used with the bunch hanging clear between them. Plates 59 to 61 illustrate the correct method of propping and the results of incorrect propping and failure to prop.

Harvesting.

Bunches must be mature and the individual fingers well filled and rounded out before being cut. The stage of maturity at which fruit should be cut varies somewhat according to whether the fruit is to be sold locally or on a distant market and according to the period of the

year. In no instance, however, should fruit that is sharply angled be cut. Knowledge of the exact stage for harvesting can best be gained by experience. Flesh colour is the surest guide to maturity and is gauged by cutting across a fruit selected from the lower hands of the bunch. In mature fruit the flesh should exhibit a cream colour and the core of the fruit should be full. If the flesh is white or the core of jelly-like consistency immaturity is indicated. Another fairly reliable test of maturity is the drying and shedding of all the floral parts from the ends of the fingers.

The best implement for severing the bunch from the plant is a cane knife. In cutting Cavendish bunches the weight of the bunch should be taken on the slightly bent leg, the stem grasped just above the top hand and the bunch severed with a single stroke of the knife. Tall varieties are harvested by cutting a scarf into the belly of the plant. This allows the plant to come over easily so that the bunch can be severed in the usual manner when it bends down within reach. The only point to watch in harvesting tall varieties is that the scarf is cut in the front and not the back of the stem. A cut in the back allows a sudden fall of the plant resulting in a damaged bunch and possibly injury to the harvester.

A good crook should be left on the stem for ease in handling. Many growers also use the long stem to stand the bunch upon in an inverted position to prevent damage to the bottom hand that would occur if the bunch was stacked the normal way up. This is good practice if the bottom hand contains marketable fruit, but care should be taken to see that the stem is long enough to keep the top hand clear of the ground. Where the bottom hand is of poor quality and unmarketable it is immaterial on which end the bunch is stacked. The important thing, however, is that it is stood on one end and not laid on its side to cause bending of fruit and rupturing of cells in the stalk end with subsequent development of black end.

When the bunch is cut from a plant all the leaves are also cut off with a single cut through the crown. The pseudostem should then also be cut down to within 12 inches of the ground and the fallen portion cut into short sections and sliced in half to assist rapid disintegration to prevent it becoming harbourage for beetle borer. If the harvesting is a large one the cutting down and slicing of spent plants is usually reserved until the day's harvesting has been completed.

As the bunches are cut the customary practice is to carry them from two rows each side into a centre row and stack them on leaves in the shade of the stools, covering them if necessary with other leaves to protect them from the sun. This practice of carrying to every fourth row makes the subsequent carrying out to the cart tracks easier and also minimises the possibility of cut bunches being missed when collecting them.

Carrying out should be done with a yoke, two bunches being carried at once, one slung on each end of the yoke. The most comfortable yoke to use is a properly shaped one that distributes the weight evenly over the shoulders and back of the neck. A short, padded stick is used by many growers but this is rarely so comfortable as a well-shaped yoke. Under no circumstances must the bunches be carried singly on the shoulder or under the arm as this causes exactly the same damage that results from lying the bunches on their sides. It will probably mean

the loss of several hands of fruit from each bunch so carried. Bunches should be carefully stacked on end on the cart or motor truck used to convey them to the packing shed and a padding of leaves should be used to protect them from damage.

Dehanding of the bunches is usually carried out on the day upon which they are harvested. The hands should be carefully stacked according to grade, each grade being given a separate stack. At some periods of the year, particularly during the wet season period, excessive bleeding takes place on dehanding. The sap causes staining and disfiguring of the fruit, so special care is necessary to ensure that the sap drains away clear of the fruit. Packing should never be commenced until the fruit has had at least 24 hours' sweating after dehanding. This period allows the skin to toughen and the fruit to become slightly pliable so that it does not so easily suffer injury in handling and packing.

The grading, handling, and packing of bananas are fully described in a publication of the Department, entitled "Packing Bananas for Market," which is obtainable free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, or to the local office of the Department.

Pests and Diseases.

The chief pests attacking bananas in North Queensland are fruit fly, beetle borer, thrips, fruit eating caterpillar, and fruit spotting bug. Preventive measures constitute the best control against fruit fly. These consist chiefly in never allowing any ripe or damaged fruit to remain in the plantation, and covering the bunches from about half maturity with hessian or stockinette bags. Beetle borer control is effected by using poison baits made from spent butts or stem sections. Thrips, fruit eating caterpillar and fruit spotting bug may be controlled by spraying or dusting the bunches with the appropriate mixture supplemented by hand picking and killing the insects.

The main diseases are Cercospora leaf spot and Panama disease. The former attacks all varieties except Ducasses, but some other varieties appear to have some degree of resistance. Panama disease in prevalent in all tall-growing varieties in the North. Pamphlets dealing with pests and diseases of bananas and the control measures to be employed in combating them may be obtained free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Replanting.

Owing to the gross feeding habits of the banana and its requirement of high humus content in the soil, it is not desirable to endeavour to maintain an area of land continuously under bananas for an indefinite period. The ploughing out of the plantation after a period of some four or five years and the green cropping of the land for one or two seasons before replanting is sound practice. Opportunity is thus given to building up the humus content, to deep poughing of the land, to control of beetle borer and other pests and of diseases, and to maintaining the plantation in a youthful condition. In permanent banana-growing it is desirable to work the crop on a similar principle to that employed by the canegrower; that is, to have portion of the land under green fallow, and the remainder under plant crop, first, second, and third ratoon crops.

APPLIED BOTANY

Bulbous Oat Grass or Onion Couch,* a Possible Weed Pest.

C. T. WHITE, Government Botanist.

SOME years ago, in 1927, specimens of this grass from Maleny were received from Mr. R. A. Gibson, who evidently destroyed the patch as it has not been heard of in that district since; and had not been reported again in Queensland until recently when specimens of it were sent by Mr. F. Gipps, who stated that it was established in a small way on Tambourine Mountain. It is rather a serious weed pest in England and has been naturalised in the southern States of Australia for some time although it it not known that it has proved an aggressive weed there. Bulbous oat grass is the standardised local name adopted in Australia, but it is also frequently known as onion couch, onion twitch, and pearl grass. Its most characteristic feature is its rootstock, the internodes of which are swollen into small "bulbs" about the size of a pea. frequently borne in necklace-like strings. Each "bulb," when detached separately by cutting with plough, spade, or other implement, is capable of forming a fresh plant. Fortunately they mostly occur just below the surface of the soil, hence do not present the same problem as nut grass or Johnson grass.

Plate 62.

BULBOUS OAT GRASS OR ONION COUCH. (About half natural size.)

As it has the possibility of becoming a pest in cultivation, farmers in the cooler districts of Queensland are advised to keep a watch out for it and eradicate it as soon as it makes its appearance. When in flower it is distinguished by its soft, spreading head, much like a very small variety of oat. The accompanying illustration, reproduced from a publication (*Weeds of Arable Land*, by H. C. Long) of the British Ministry of Agriculture and Fisheries, should enable anyone to recognise the grass on sight.

* *Arrhenatherum elatius* var. *bulbosum*.

ANSWERS.

(Selections from the outward mail of the Government Botanist.)

"Devil's Claw."

O.L.H. (Rockhampton)—

The plant that produces the seeds submitted is the Devil's Claw (*Martynia lutea*), a native of South America and now fairly common in Queensland. Other popular names for it are Unicorn Plant, Elephant's Trunk, and Devil's Grip. It is also sometimes known as Pumpkin Vine from the growth of the plants.

The large clawed seed vessels occasionally become entangled about the hocks of horses and cattle. They also become caught up in the thick wool of sheep. At shearing time these clawed seed vessels, if they are not noticed by the shearer, often cause breakages in the teeth of the shearing machines.

The plant does not appear to be eaten by stock. It should be eradicated before the seeds ripen. Naturally, the best method of eradication is by cutting the plants with a hoe below the soil.

Common Vetch.

C.S. (Tambourine Mountain)—

Your specimen is the Common Vetch (*Vicia sativa*, variety *segetalis*). This plant, which is a legume, is well known to produce hoven in stock. The seeds contain a substance which produces prussic acid, and animals have been poisoned by eating feed which contained considerable quantities of the seeds of this plant.

Trees Suitable for the Bowen District.

Inquirer (Bowen)—

Trees suitable for the Bowen District as shelter belts include Burdekin Plum and Peltophorum.

Both are raised in large quantities for street planting in the Botanic Gardens, Rockhampton. Other suggestions are:—

Mango.—Makes a good shelter belt, but is sometimes objectionable because of attracting flying foxes.

Rain Tree.—There are some fine specimens of this tree about Townsville, and possibly plants or seeds could be obtained from there.

Camphor Laurel.—Not grown to any extent about Bowen or Townsville, but should be worth trying.

Cypress Pines.—These are favourites for hedge purposes and shelter belts in the southern parts of the State, but probably Bowen would be rather hot for most of them. The most likely one to do well there is the Sand Cypress (*Callitris columellaris*), normally raised in large quantities by the Queensland Forest Service for distribution.

Figs.—Some of the figs such as the Weeping Fig and the Banyan make excellent shelter belts, but have the disadvantage of robbing the ground nearby of its fertility.

Blue Weed or Paterson's Curse.

The specimen bore no flowers or seeds, but has been recognised as Blue Weed or Paterson's Curse (*Echium plantagineum*). It is not known to be poisonous or harmful at any stage of its growth. It is said to be eaten by stock in its very young stages, but soon becomes harsh and quite unpalatable. If possible it should be eradicated before it seeds. The plant is a native of southern Europe and is much more abundant in the southern States of Australia than in Queensland. In South Australia particularly, it covers large areas of wheat stubble and because of its blue flowers is known as Salvation Jane. The flowers vaguely suggest a Salvation Army lassie's bonnet.

PLANT PROTECTION

Bean Pests in Queensland.

N. E. H. CALDWELL, Assistant Research Officer.

THE dwarf French bean is the principal edible bean grown in Queensland. In the southern portions of the State, it is the only bean cultivated on a commercial scale, but varieties of runner or climbing French beans, long beans*, and Tonga beans† are also utilized to a limited extent in home gardens. In North Queensland, owing to climatic conditions, the types produced are rather more varied. The dwarf French bean is still the main variety grown, but long beans are also produced on a commercial scale. In addition, sword‡ and jack§ beans are grown fairly extensively in home and market gardens while climbing French and Tonga beans also find a place in home gardens.

The bean fly is the outstanding pest of the more important edible beans. Flower-eating and pod-boring caterpillars and the green vegetable bug may, at times, assume considerable importance while a number of minor pests occasionally cause some damage. The following key will assist in identifying the various species discussed in the text:—

KEY TO BEAN PESTS.

1. Small, active, shining black flies on leaves; small, yellowish spots on leaves, concentrated near stalk; plants collapse at or near ground level; if plants survive, rusty-red, calloused areas are formed on stems and/or leaf stalks .. .. **Bean Fly**

2. Clusters of small, globular, greenish-black insects on undersides of leaves, round growing tips, on flower stalks and on pods **Bean Aphid**

3. Dried patches on upper surface of leaf; bright-red larva usually inside leaf .. .. **Leaf Miner**

4. Leaves with mottled, yellowish appearance; mites just visible to naked eye on undersides and associated with fine webbing **Red Spider**

5. Stalks malformed, with numerous side-shoots; pods twisted and curled; very small, active, brown to black insects, sometimes accompanied by yellow or orange-red larvae, in flowers or in colonies on pods or undersides of leaves .. .. **Bean Thrips**

6. Flowers damaged and webbed together—
   (a) Active, green caterpillar, usually marked with rows of black spots, about ¾ inch long when full-grown .. .. **Bean Pod Borer**
   (b) Slow-moving, slug-like, pinkish caterpillar, about ⅛ inch long when full-grown .. .. **Bean Flower Caterpillar**

* *Vigna sesquipedalis.*
† *Dolichos lablab.*
‡ *Canavalia gladiata.*
§ *Canavalia ensiformis.*

7. Pods eaten—
   (a) Pods with holes frequently marked by excreta; active, green caterpillar about ¾ inch long when full-grown, usually marked with rows of black spots, inside the pods .. .. **Bean Pod Borer**
   (b) Large, conspicuously-coloured caterpillar, about 1½ inches long when full-grown, eating holes in pods but usually not burrowing within them .. .. **Corn Ear Worm**
   (c) Large, green caterpillar, about 1½ inches long, moving with a looping action; eats holes in pods and destroys leaves **Green Looper Caterpillar**
8. Bugs present—
   (a) Shield-shaped bugs, ¼ to ¾ inch long, green or brown in colour **Green Vegetable Bug and Associated Species**
   (b) Long-legged, slender, reddish-brown bug, with yellowish-white markings along side of body; ¾ inch long .. **Pod-sucking Bug**
9. Plants unthrifty with a general, yellowish appearance; swellings of varying sizes on roots .. .. **Nematodes**
10 Seeds with small, circular holes; small, brown beetles present **Bean Bruchids**

BEAN FLY.

French beans are particularly susceptible to bean fly attack. The earliest symptom of injury in young plants is a drooping of the first two leaves and this is frequently followed by the collapse of the plant at

1 2 3

Plate 64.

Bean Fly Damage in French Beans: Fig. 1.—Stem callus at ground level; Fig. 2.—Section through lower stem; note larva at left under the surface; Fig. 3.—Section through upper stem; note pupa below the fork.

or near ground level. Should the plant survive, the stem may split and a rusty-red callus (Plate 64) forms over the damaged area. Adventitious or secondary roots usually develop at or above this calloused section if the soil has been hilled up round the plant. The plant

may then bear a reasonable crop when growing conditions are good and the injury moderate, but if more severely damaged, it remains unthrifty. In older plants, the larvae tend to remain in the leaf stalks and axils where they produce swollen, discoloured, and sometimes calloused areas. In such cases, the cropping capacity of the plants may not be impaired, but wind damage and breakage during picking may cause some wastage.

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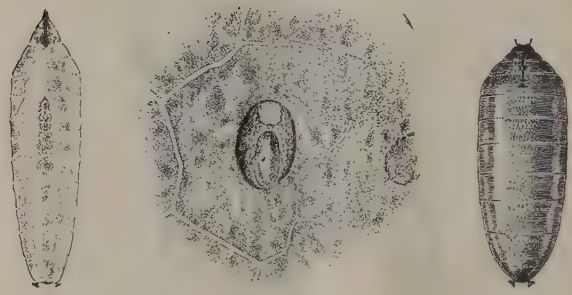


3 2 4

[*Drawings by William Manley.*

Plate 63.

BEAN FLY: Fig. 1.—Adult fly × 15; Fig. 2.—Egg inside leaf tissue × 30; Fig. 3.—Larva × 15; Fig. 4.—Pupal case × 15.

Long beans possess a considerable degree of resistance to bean fly attack, at least in the tropics. Young plants may succumb, however, though the percentage of survivors is usually much greater than in French beans grown under the same conditions. If the initial growing point of the plant is killed, a side-shoot frequently develops and, even though growth may be considerably retarded for a period, a profitable plant is usually produced. Once the first climbing tendrils appear, long beans are able to withstand very severe fly infestation. Sword and jack beans are apparently not damaged in any way by bean fly. In Tonga beans the only injury noted has been localised in the leaf stalk and this has little adverse effect on growth.

Life History and Habits.

The bean fly* is a shining, black fly (Plate 63; fig. 1) about one-eighth of an inch in length which can be readily seen resting on the leaves of bean plants. The female fly lays its egg (Plate 63; fig. 2) in punctures on the upper surface of the leaves, usually near the stalk end. These punctures appear as yellowish spots on the leaf and provide an easy means of determining whether the bean fly is active even though the insect itself may not be recognized. Minute, white or cream coloured larvae hatch from the eggs and mine between the upper and lower surfaces of the leaf and work their way into the leaf stalk. Then, depending on the type of bean and the age of the plant, either they may tunnel through the leaf stalk and the main stem of the plant down to ground level or they may complete their development in the leaf stalk or the leaf axil or even in the main stem some distance above ground level. When full-grown, the larvae (Plate 63; fig. 3) pupate just beneath the outer surface of the stem or leaf stalk where they can be seen when this outer layer is stripped away. At first white in colour, but quickly changing to brown, the pupal case (Plate 63; fig. 4) is about one-tenth of an inch in length.

The eggs hatch in two to four days in warm weather. The larvae take one to two days to mine through the leaf into the stalk and feed for about another seven days before pupating. Nine or ten days later the adult flies emerge, the life cycle thus being completed in about three weeks. In cool weather, however, the rate of development is much slower.

Control.

Bean fly can be satisfactorily controlled by a spray containing 1 part of nicotine sulphate, 8 parts of summer white spraying oil and 800 parts of water. Convenient formulae are:—

	(1)	(2)	(3)
Nicotine sulphate ..	¼ pint	.. 1 fluid oz.	.. 1 teaspoonful
White oil	2 pints	.. 8 fluid oz.	.. 8 teaspoonfuls
Water	25 gallons	.. 5 gallons	.. 5 pints

The timing of the spray applications is based on the duration of the life cycle stages of the fly and any appreciable departure from the treatment schedule is likely to result in considerable loss. In southern and central parts of the State, the spray should be applied three days after the first beans appear above the ground and thereafter at four-day intervals. In northern districts, the period between sprays should be reduced to three days.

The number of treatments applied to any crop depends on the district, the time of the year and the type of bean. French beans grown in the southern and central districts usually require four to six sprays for mid- and late-summer plantings, while two to four are sufficient in autumn and early winter. In the north, at least four applications are necessary during winter and spring; in autumn six treatments are needed to give adequate protection. Three to four applications control the pest in long beans grown during the summer months in North Queensland.

As only the tops of the leaves need be sprayed, 30 to 50 gallons of the insecticide will be adequate for an acre of beans at average planting distances. A new batch of spray should be prepared for each application

* *Agromyza phaseoli* Coq.

as the mixture deteriorates very rapidly when held in open containers. Once the spray has dried on the leaves, rain does little harm, but if a shower occurs very shortly after an application, the treatment should be repeated. Continuous rain, of course, will render spraying impracticable, but under such conditions fly activity is reduced and the ill-effects of any such interference with the spraying schedule are often less than might be expected.

Vigorous, quick-growing crops are better able to withstand bean fly attack than those which are developing slowly. Therefore, cultural measures, such as early and thorough hilling up, which encourage the formation of secondary roots from the stem, are an essential part of the bean fly control programme. Where irrigation facilities are available well-timed waterings can be used to keep the plants growing and thus minimize the damage caused by the pest.

Many crops of both French and long beans are grown without the use of insecticides, but complete or partial failures, due to bean fly attack, are all too common. Growers who wish to place their bean-growing ventures on a sound basis must, therefore, carry out control measures in all districts where this pest occurs. Only in one of the several producing areas—Stanthorpe—is the incidence of bean fly so slight that control measures are unnecessary.

BEAN APHID.

The bean aphid may at times become very prevalent, notably on long beans growing in the spring months. The leaves of heavily infested young plants take on a pronounced yellowish hue and growth is greatly retarded. Once the plants have started to climb, however, they are normally able to maintain a reasonable rate of growth. Malformation of the pods may be caused by large colonies feeding on them, but this type of injury is not common.

Life History and Habits.

This insect* (Plate 65; figs. 1 and 2) is a sluggish, greenish-black insect about one-tenth of an inch in length, which is usually found in dense colonies (Plate 65; fig. 3) on the undersides of leaves, round growing tips, on flower stalks, and on pods. Breeding takes place on the plant and, as the majority of the insects do not wander far, the colonies usually comprise both immature and adult stages.

Control.

Nicotine, applied either as a dust or as a spray, will normally control aphids. Hence, if the nicotine sulphate-white oil spray is used in the early stages of growth for bean fly control, aphid infestation should be kept at a low level until flowering occurs. Aphids sometimes become numerous, even on sprayed plants, owing to their preference for the undersides of the leaves which are not normally wetted by bean fly sprays; a more thorough application of the insecticide will then be necessary. Should the pest persist or reappear after bean fly control measures have ceased, applications of a 3 per cent. nicotine dust or of

* *Doralis fabae* L.

a spray prepared by adding ½ pint of nicotine sulphate to a solution of 2 lb. of soft soap in 50 gallons of water will give effective control. Dusts are more satisfactory than sprays for the treatment of large plants as more efficient coverage can usually be obtained when they are used. Aphid-infested pods should not be packed with clean samples when the crop is harvested.

1

2

[*Drawings by William Manley*

3

Plate 65.

Bean Aphid: Fig. 1.—Wingless female × 10; Fig. 2.—Winged female × 10; Fig. 3.—Bean leaves infested with aphids.

BEAN THRIPS.

The dwarf French bean is apparently the only edible legume which suffers commercial injury from bean thrips. This injury may take several forms. The commonest and probably the most important damage is a curling of the pods (Plate 66; fig. 2) which follows attacks within the flowers when pod formation is in progress. Many beans so attacked are quite unmarketable. Damage of secondary importance is a russetting caused by larval colonies feeding on pods approaching maturity. This type of injury occurs only when large numbers of thrips are present on the plant. Rusty pods are almost invariably

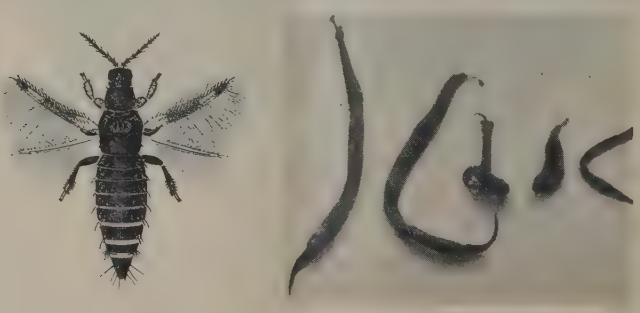
malformed, but malformed pods may not be rusty; rust and malformation are only associated when the attack begins in the flower and continues during pod development.

Thrips may also feed in the growing point of young plants before they reach the flowering stage. This sometimes results in gross distortion, the main stem being transformed into a broad, flattened, strap-like structure, usually severely twisted at the tip. Growth at the main growing point may then be suppressed and a number of side-shoots develop, giving the plant a somewhat bunched appearance. Should colonies of larvae occur on the undersides of leaves, the margins turn downwards, the upper surface assumes a puckered appearance and the under surface becomes russetted. Under good growing conditions, many plants will make a more or less complete recovery from such attacks in the early stages of growth, for one or more of the secondary shoots may develop and flower normally, though, of course, the pods may still be malformed if the thrips population remains high. However, if growing conditions are poor—owing to lack of moisture or to other factors—the plants remain stunted and unthrifty and the few pods produced are malformed and rusty.

Where successional plantings are made—the normal practice in bean-growing districts—later planted crops usually suffer more severely than earlier ones. Presumably there is a gradual build-up in the thrips population during the season and the insects "spill over" from the older to the younger plantings, especially when the former cease flowering.

Life History and Habits.

The bean thrips* (Plate 66; fig. 1) is a very small, active, dark-brown insect about one-sixteenth of an inch in length. It is usually present in the flowers of most edible beans, but also occurs at times in



1 2

[*Drawing by William Manley.*

Plate 66.

BEAN THRIPS: Fig. 1.—Adult thrips × 20; Fig. 2.—Thrips-damaged beans.

the terminal buds and on the leaves and pods of dwarf French beans. In the flowers it may be accompanied by several other species of thrips, but the only one† of these found in large numbers is pale yellowish-brown in colour and hence not liable to be confused with the more important pest species in beans. These other species are not known to have any injurious effect on bean plants.

* *Taeniothrips nigricornis* Schm.

† *Thrips tabaci* Lind.

The eggs are inserted by the female thrips into the tissue of the leaves, flowers and pods. On hatching, the pale yellow larvae, which later turn to a deep yellow or orange-red colour, congregate in considerable numbers in the flowers and, at times, colonies are established on the leaves and pods. When full-grown the larvae leave the plant and pupate in the soil. After a period, the adult insects emerge from the pupae and return to the plant. Flowers are the favourite haunt of adult thrips and up to 20 or 30 may be seen scurrying from a heavily-infested blossom as it is opened up for examination.

Control.

The application of the nicotine sulphate-white oil spray for bean fly control will keep thrips down to negligible proportions in the early stages of growth. Thus, where the recommended bean fly control measures are followed, severe malformation and stunting of the plants should not occur. Further insecticidal applications are, however, at times necessary later in the growing period if the condition of other crops in the vicinity and the number of thrips in the first-formed flowers suggest the possibility of an outbreak. Some growers have made one or two applications of the nicotine sulphate-white oil spray at flowering time, apparently with some success. Better results should be obtained from the use of a nicotine dust owing to the more satisfactory penetration usually secured on well-grown plants. It is suggested, therefore, that two applications of a 3 per cent. nicotine dust be made, at an interval of seven to ten days, when the plants are in full flower. If a spray is preferred, the nicotine sulphate-white oil formula may be used or the nicotine sulphate spray, which was recommended for the control of the bean aphid, may be employed.

BEAN POD BORER.

Considerable damage may be caused to the pods of French, long, sword, jack, and Tonga beans by the bean pod borer, a pest which may also be responsible for faulty setting of sword, jack, and Tonga beans, when a heavy infestation occurs in the flowers. The larva may also enter and burrow down the leaf stalks of French beans.

Life History and Habits.

The bean pod borer*, which is the commonest flower and pod-eating caterpillar, is the larva of a rather inconspicuous moth with a wing spread of slightly more than an inch (Plate 67; fig. 1). The forewings of the moth are yellowish-brown with several translucent spots, while the hindwings are mostly free from scales except for a brownish fringe. The larva (Plate 67; fig. 2), when full-grown, is about three-quarters of an inch in length. The colour of the larva varies considerably from pale greenish-yellow to bright green and, characteristically, there are several rows of dark-brown to black spots along the body. Sometimes these spots are very pale and not conspicuous. The head and the upper side of the first thoracic segment are dark-brown to black.

The moths remain concealed in the plants during the day and when disturbed fly rapidly to another sheltered spot. Eggs are apparently laid on or near the flower buds and, immediately on hatching, the young larva enters a bud, an open flower or even a pod. Pod destruction, however, is mostly due to fairly well-grown larvae which have previously fed on flowers in the vicinity and are seeking new feeding

* *Maruca testulalis* Geyer.

grounds. When a pod is attacked, the larva burrows inside, its presence being disclosed only by the entrance hole from which a certain amount of refuse may protrude. The larva spins numerous silken threads as it moves about and infested flowers are thus usually webbed together.

1

2 3

[*Drawings by William Manley.*

Plate 67.

BEAN POD BORER: Fig. 1.—Adult moth × 3; Fig. 2.—Larva × 3; Fig. 3.—Pupa × 3.

Adjacent pods or pods and leaves may also be joined by webbing wherever larvae enter the pods. When full-grown, the larva leaves the plant and pupates (Plate 67; fig. 3) amongst debris on or near the surface of the ground.

Control.

The control of the bean pod borer, the corn ear worm, the bean flower caterpillar, and the green looper caterpillars is discussed on page 165.

CORN EAR WORM.

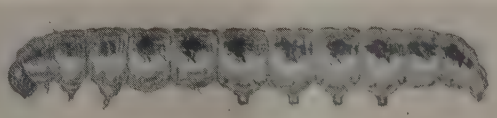
The corn ear worm* (Plate 68), which is a very destructive pest of many crops, occasionally does considerable damage to French beans by eating the pods. Small pods may be almost completely consumed while whole sections are eaten out of larger pods. Unlike the bean pod borer, the corn ear worm does not usually conceal itself by burrowing within the pods. At times this pest may also feed to some extent on the flowers.

Life History and Habits.

This pod and flower-eating pest is the larva of a stoutly-built moth measuring about one and a-half inches across the outstretched wings. The forewings are greyish-green, often tinted with red, and the hindwings are creamy-yellow with smoky markings. The larva, when full-grown, is about one and a-half inches in length and variable in colour.

* *Heliothis armigera* Hbn.

with shades of green, brown, yellow and red interspersed with black markings, while along each side of the body is a yellowish-white band. When full-grown, the larva leaves the plant and pupates within an earthen cell in the soil.



[*Drawing by William Manley.*

Plate 68.

Corn Ear Worm × 2.

BEAN FLOWER CATERPILLAR.

Like the bean pod borer, the bean flower caterpillar* also feeds in the flowers, but it is not known to attack the pods once these have formed. Flowers on which the caterpillar has fed invariably fail to set fruit, and this insect thus shares with the pod borer responsibility for poor crop setting. So far it has been observed to attack only sword, jack, and Tonga beans.

Life History and Habits.

The bean flower caterpillar is a stout, somewhat slug-like grub, usually pinkish in colour and about half-an-inch in length when full-grown. It is sluggish in its movements and this characteristic, in addition to its totally different appearance, serves to distinguish it from the bean pod borer. The bean flower caterpillar is the larva of a handsome, dark-blue butterfly, measuring about an inch and a quarter across the outstretched wings.

GREEN LOOPER CATERPILLARS.

Green looper caterpillars† cause injury similar to that inflicted by the corn ear worm and also destroy a considerable amount of foliage. They are green in colour and move with a looping action. The parent moths are golden-brown with conspicuous silver spots on the forewings: the wing span is about an inch and a-half.

CONTROL OF FLOWER AND POD-EATING CATERPILLARS.

Control of the flower and pod eating caterpillars presents a difficult problem for which no satisfactory solution has yet been found. There is some evidence that a derris dust containing 1 per cent. or more of rotenone and a 3 per cent. nicotine dust may have a beneficial effect, particularly against the pod borer and the flower caterpillar, and weekly applications may, therefore, be made when these caterpillars are present. Derris dusts, however, are of little value in the control of the corn ear worm. A 50 per cent. arsenate of lead dust will give some control of this and similar pests, but its use must be restricted to the early stages of flowering in order to avoid the accumulation of poisonous residues on the pods. Dusts containing derris or arsenate of lead should give better results than the corresponding sprays.

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* *Jamices phaseli* Math.

† *Plusia chalcites* Esper. and *P. argentifera* Guen.

GREEN VEGETABLE AND OTHER SHIELD BUGS.

In French beans the green vegetable bug* may cause severe stunting and weakening of the plant, shrivelling and malformation of the young pods, and mottling of the older pods. Usually, however, the damage is limited to a certain amount of pod distortion. Three other shield bugs, as well as the green vegetable bug, may occur in large numbers on long beans, but, when the plants are growing vigorously, the injury inflicted by them may not be serious.

Life History and Habits.

The adult green vegetable bug (Plate 69; fig. 3) is a typical shield bug about half-an-inch in length by one-third of an inch in width. It lays its cylindrical, cup-shaped eggs in clusters containing up to 150 eggs, usually on the undersides of the leaves. The nymphs emerging from them are conspicuously coloured, being at first bright orange and later marked with black, green, yellow and red patterns The nymphs grow by a succession of moults, all of which take place on the plant.

[*Drawings by William Manley.*

Plate 69.

BEAN FEEDING BUGS: Fig. 1.—Piezodorus bug × 3; Fig. 2.—Agapophyta bug × 2; Fig. 3.—Green Vegetable Bug × 2.

The largest of the other three species of shield bugs—mentioned above as being associated with dwarf and climbing beans—is the Agapophyta bug† (Plate 69; fig. 2), which is about three-quarters of an inch in length and is predominantly green in colour. The second species‡, the Piezodorus bug (Plate 69; fig. 1), is about three-eighths of an inch in length and is not unlike a small green vegetable bug, but it may be distinguished from this more important pest by the presence of a distinct, salmon-pink, transverse stripe across the front half of the body. The third species§ is also about one-quarter of an inch in length, but is brown in colour.

Control.

The control of these shield bugs by insecticides is not on a satisfactory basis. Some growers claim a certain amount of success with the nicotine sulphate-white oil spray, which is used for bean fly control.

* *Nezara viridula* L.

† *Agapophyta bipunctata* Boisd.

‡ *Piezodorus rubrofasciatus* Fabr.

§ *Oncocoris* sp.

while a derris spray, at about twice the normal strength, will kill a percentage of the nymphs. Any insecticide used must be applied at about weekly intervals to achieve worth-while results. Collecting and destroying all adults, nymphs, and eggs encountered during picking or other operations is of some value in small areas.

An introduced wasp parasite* of the eggs of the green vegetable bug is now widely distributed throughout the State, but it does not completely control this pest and outbreaks may still occur. Its presence may be detected by the fact that egg masses of the bug normally develop a pink tinge in the later stages of incubation, whereas, if the parasite is active, the egg masses acquire a greyish and not a pinkish shade. Any egg masses showing the greyish colour should not be destroyed.

POD-SUCKING BUG.

Another species of bug, known as the pod-sucking bug, has been recorded as feeding on beans and producing a shrivelling of the pods, and particularly of the seeds, which are, in many cases, reduced to little more than husks.

[*Drawing by William Manley.*

Plate 70.
Pod Sucking Bug × 2.

Life History and Habits.

The pod-sucking bug† (Plate 70) is an active, rather slender bug, about three-quarters of an inch in length, with long legs and antennae. It is predominantly reddish-brown in colour with conspicuous yellowish-white markings along the side of the body. Both adults and nymphs

* *Microphanurus basalis* Woll.
† *Riptortus surripes* Fabr.

of this species may occur in considerable numbers on beans, the former having the characteristic habit of congregating and feeding on the pods, a habit which has given rise to the common name.

Control.

The discussion on control measures for the green vegetable and other shield bugs contains information that is equally applicable to the pod-sucking bug.

LEAF MINER.

A very small, red grub, the larva of a minute moth,* is commonly found mining in the leaves of the long bean, eating away the leaf tissue between the upper and lower surfaces. Frequently, quite large patches on the leaves may die, but the growth of this vigorous climbing bean is seldom seriously retarded by the leaf miner. The bean fly control schedule should ensure freedom from leaf miner attack during the early stages of growth; control measures in the later stages of the development of the crop have not yet been needed.

RED SPIDER.

A small mite (Plate 71), commonly known as the red spider,† may attack French, long, sword, and jack beans. Infestation is usually confined to the leaves, the upper surfaces of which take on a faintly mottled and then a yellowish appearance while the lower surfaces are

[*Drawing by William Manley.*

Plate 71.

RED SPIDER × 100.

more or less russetted. The minute mites, which are usually red in colour and just visible to the naked eye, are found on the undersides of the leaves in association with very fine webbing.

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* Fam. *Gracilariidae*.

† *Tetranychus urticae* Koch.

Control.

Red spider is characteristically a pest in the spring months. If an outbreak is severe enough to warrant the application of control measures, a sulphur dust, prepared from equal parts of sulphur and hydrated lime, should be applied to the crop. Thorough application is necessary to ensure that the dust gets beneath the leaves and more than one treatment may be needed.

NEMATODES.

While nematodes* are not normally a serious limiting factor to the production of edible beans, the roots of dwarf French beans sometimes become heavily infested on sandy soils where the nematode population is high. Attacked plants are usually somewhat stunted and yellowish in appearance, and the death of severely infested plants frequently follows heavy rain or excessive irrigation. Infested crops may have a patchy appearance, the more seriously affected plants being located in small areas scattered throughout the crop. The presence of nematodes is readily revealed by the knotted, swollen condition of the roots, frequently accompanied by some degree of decay. Swellings due to nematodes are not to be confused with the useful bacterial nodules which can be easily detached from the roots and occur normally on healthy bean plants.

Life History and Habits.

Nematodes are minute worms, the full-grown female measuring only one twenty-fifth of an inch in length and the male considerably less. They spend part of their life in the plant and part in the soil where they can survive for long periods even when no crops are grown.

Control.

The control of these pests is extremely difficult and their eradication from the soil is quite impracticable under field conditions. Losses can be minimized by good cultural measures such as careful soil preparation, adequate cultivation of the growing crop, correct fertilizing, and judicious watering. Beans should not be grown continuously on the same land nor should they follow crops of other more susceptible plants such as tomatoes.

BEAN BRUCHIDS.

Bean bruchids attack the seeds of edible beans which are frequently stored on the farm from one season to the next. Two species† are involved and each shows a preference for particular kinds of seed. Their habits and appearance are similar and control measures are identical.

Life History and Habits.

The typical bruchid (Plate 72; fig. 4) is about one-sixth of an inch in length, brown to reddish-brown in colour with grey, white, brown or black patches on the back. The small, white eggs (Plate 72; fig. 2) are laid singly on the outside of the seed and firmly fixed to its surface. On emerging from the egg, the small white larva (Plate 72; fig. 1) bores into the seed, in which it feeds voraciously. Often, the whole of the inside is destroyed and only the outer skin remains intact. The pupal stage (Plate 72; fig. 3) is spent in the seed.

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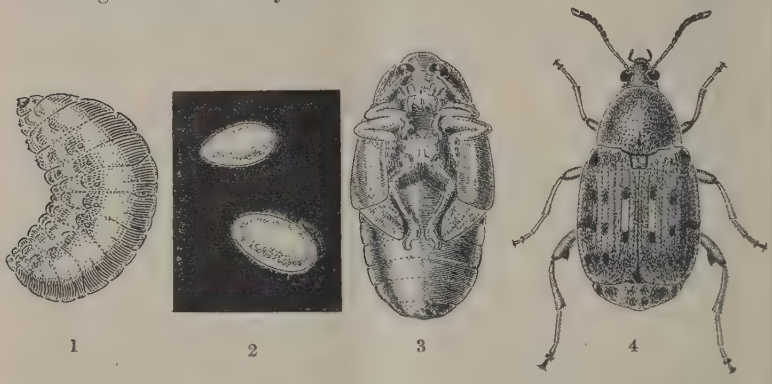
* *Heterodera marioni* (Cornu) Goodey.

† *Bruchus chinensis* Thunb. is the usual pest of French bean seed. *B. quadrimaculatus* Fabr. attacks the seed of some other edible beans.

When the adult is ready to emerge, it cuts a circular hole through the seed coat, giving a characteristic appearance to infested seeds from which the adults have emerged. Development is rapid and there are several generations each year.



[*Drawings by William Manley.*

Plate 72.

BEAN BRUCHID: Fig. 1.—Larva × 10; Fig. 2.—Egg × 25; Fig. 3.—Pupa × 10; Fig. 4.—Adult × 10.

Control.

Infestation may take place in the field before the seed is harvested and if the stocks are not treated at the beginning of the storage period, a great deal of wastage can occur. The seed may be stored in insect-proof drums, provided 8 oz. of naphthalene or 4 oz. of paradichlorobenzene are mixed with each bushel of seed. The seed can be stored in bags if it is first treated with a mixture of 8 oz. of naphthalene and 8 oz. of paradichlorobenzene. On no account must seed treated with paradichlorobenzene be used for feed purposes. Should naphthalene and paradichlorobenzene not be available, a considerable degree of protection can be given to bean seed by mixing it with ground dolomite or magnesite at the rate of 4 oz. per bushel of seed. Neither dust is poisonous and they can therefore be used with complete safety.

SUMMARY OF SUGGESTED CONTROL MEASURES FOR THE MORE IMPORTANT BEAN PESTS.

1. Vigorous growth should be maintained in the crop by correct cultural methods. Particularly important are proper soil preparation before planting, early and thorough hilling up—especially of varieties susceptible to bean fly attack—and, if irrigation facilities are available, adequate watering.

2. French and long beans should be sprayed with nicotine sulphate-white oil three days after the first plants appear above ground and then at four-day intervals in southern and central districts and at three-day intervals in the north. Two to six spray applications are necessary for French beans depending on the time of the year and the location of the crop and three to four for long beans.

3. One or more applications of a nicotine sulphate-white oil spray or preferably of a 3 per cent. nicotine dust may be necessary during the flowering period to combat thrips and aphids on French and long beans respectively.

4. If flower and pod-eating caterpillars are present, applications of a derris or nicotine dust at weekly intervals may be used. This treatment cannot be expected to give good control of the corn ear worm. An arsenate of lead dust may be used to check this pest when flowering begins, but considerable care is required to ensure that poisonous residues are not present on the pods when they are marketed.

5. For the control of the various species of bugs, a nicotine sulphate-white oil spray or a double strength derris spray may be used. These should destroy many nymphs on the plant.

WOOL IN COMPETITION WITH STAPLE FIBRES.

Staple fibre is the current term for wool substitutes and staple fibre is in the field against wool, and with all the backing big business can give it. That is the position facing the wool industry. The makers of staple fibre are very experienced in modern marketing methods, and, moreover, they have the advantage of regulating production according to current market conditions. Wool, on the other hand, as a primary product, is affected by seasonal and other circumstances. The manufacturers of staple fibre are all out to improve their product and put it on every accessible market and back it up with expert publicity.

That is what the wool industry is up against, and how can it meet the menace? Fortunately, leaders in the industry are thinking ahead. They are calling on scientific research men to improve the quality of wool as a raw material in manufacture and extend the range of the uses to which wool can be put. Coupled with that effort is a call on wool producers themselves to improve the quality of their own wool clip and co-operate in the use of expert publicity in strengthening the appeal to popular favour of good quality woollen garments. Although in the view of leaders in the wool industry, staple fibre will never be removed from the textile field, it will not supersede wool, provided that Australia sees that wool is allowed to go to all those peoples desirous of using wool. There is a snag, however, in existing trade barriers, and their removal is a matter for international negotiation.

Wool is a natural product, and no synthetic fibre has done more than merely approach the characteristics of true wool. A finished woollen fabric is much better than one made of staple fibre—it is warmer, it has more elasticity, it wears better and longer, and it is a better insulator and therefore healthier to use. However, there can be no ignoring the fact that staple fibre is in the field, and that it has behind it powerful and well-organised interests. To meet this threat to Australia's most important rural industry, it is plain that all the resources of science and textile technology should be mustered. That means that scientific study and effort should start right in the paddock and go from the pastures through every pastoral practice and manufacturing process to expert merchandising in which trained publicity men will be the shock troops in a selling campaign. That is the only way, perhaps, that wool men can meet and defeat what is now accepted as a growing menace to the wool industry.

WARTIME FOOD PRODUCTION

Rationing Meat Meals and Mill Offals.

F. B. COLEMAN.

PERMITS for the purchase of blood, meat, meat and bone meals, bran and pollard, as from 1st June, 1945, will be made available as follows:—

Pigs.

Either crude protein of animal origin (in the form of blood, meat, meat and bone meal) or pollard, but not both, may be made available for pigs. Where both are asked for, preferences will be given to crude protein of animal origin. Only those farmers who purchased these stock foods prior to 21st December, 1944, or their successors, will be eligible for consideration. Bran is not available for pigs.

Dairy Cattle.

Dairy cattle supplying milk for human consumption, numbering four and over, are eligible for a ration of bran and/or pollard, or where one to three house cows are kept they may receive consideration during periods of drought. Only those farmers who purchased these stock foods prior to 21st December, 1944, or their successors, will be eligible for consideration. Blood, meat, meat and bone meal will not be available for dairy cattle.

Permits for bran and/or pollard for dairy cattle supplying milk for human consumption will be of one month's duration. Further permits will be dependent on weather conditions.

Calves.

Calves being reared on farms, supplying milk for human consumption, or supplying milk to cheese factories will receive a ration of blood or meat or meat and bone meal and pollard until they are four months old. Only those farmers who purchased these stock foods prior to 21st December, 1944, or their successors, will be eligible for consideration. Bran is not available for calves.

Poultry.

Poultry are eligible for a ration of either—

(*a*) Blood, meat, meat and bone meal, also bran and pollard, which will be available only to those poultry-keepers who received permits to purchase same in the preceding four-monthly period; or

(*b*) Commercially prepared mashes containing rationed stock foods—*i.e.*, blood, meat, meat and bone meals, bran and pollard, and possibly other foods having a high crude protein content. These mashes will have a crude protein

content of from 15½ to 17 per cent., which may vary according to the foods available. They will be available to both commercial poultry keepers and householders.

The minimum amount of these commercially prepared mashes, for which a permit will be issued, is one bag, and purchasers must be prepared to buy not less than a whole bag at a time, otherwise they will have to feed their poultry on any other foods available.

Cockerels and turkeys and other poultry being raised for killing will not receive any rations.

General.

Where buttermilk or skim milk is available, a deduction based on the crude protein content will be made from the calculated ration of crude protein.

Except under special circumstances, livestock other than those mentioned above will not be entitled to receive a ration of blood, meat, meat and bone meals, bran or pollard.

Each year is divided into three ration periods as follows:—

Ration Period.	Closing Date for Receipt of Applications.
1st February to 31st May	7th December
1st June to 30th September	7th April
1st October to 31st January	7th August

Farmers requiring blood, meat, meat and bone meals, bran and pollard or commercially prepared mashes, should make application on the undermentioned forms.

M. 104A Livestock keepers other than poultry keepers.

M. 107 Poultry keepers.

Copies of these can be obtained from all branches of the Department of Agriculture and Stock.

Unless an application has been received on or before the closing date for each period, consideration cannot be given to the issue of a permit.

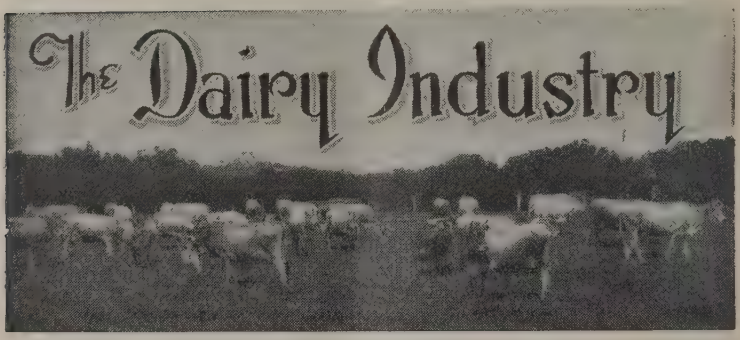
Permits must be signed and surrendered to the dealer chosen by the holder of same, who will then become the sole supplier of the meals authorised by the permit. The dealer in his turn will detach and forward to his supplier the top portion, which will be his authority to recoup his stocks. The bottom portion, upon which will be entered all sales to the person whose name appears thereon, will be returned to this Department upon completion of the permit.

Where stock food ration tickets are issued they must be endorsed on the back with the person's name and address and presented to the dealer in order to obtain supplies.

Permits or tickets relate to a specified quantity of stock foods which can be purchased during the period indicated thereon; therefore stock feeding should be arranged so as to ensure an equal distribution of the material over the whole period. This may mean an alteration in the methods of feeding.

In the case of blood, meat, meat and bone meals, conversion tables are provided for purposes of converting the amount of crude protein, appearing on the permit, into pounds of blood, meat or meat and bone meal.

Sterilised bone flour and/or meal are not rationed.



Grading-up the Dairy Herd.

E. B. RICE, Director of Dairying.

FROM Queensland's low yearly average milk and butter-fat production per cow, it is clearly evident that herd improvement is urgently desirable. This improvement which could be achieved by the grading-up of herds, would be of national benefit by raising the standards of the dairy industry, and thus ensuring also its greater prosperity.

What is Grading-up?

Grading-up means the use of successive purebred bulls on female stock originally of mixed breeding, with the object of leading the stock from generation to generation towards the uniformity of purebred type. It is the system of breeding pre-eminently suitable for ordinary commercial dairy herds for the following reasons:—

(*a*) It enables herd improvement to be effected by a farmer who can buy a purebred bull, but who may not have enough capital to purchase all purebred stock;

(*b*) It justifies the outlay of more money to buy better sires as the herd production advances;

(*c*) It enables the dairy farmer to cull more strictly and carefully than he might feel disposed to do with purebred stock.

In grade herds the economic consideration (that is, the value of milk or cream produced) must be foremost; and as the animals are usually valued at less than purebreds, culling is likely to be more drastic. Among purebred stock, the tendency is usually against strict culling.

Why Use a Purebred Bull?

In the blood of the good purebred dairy bull, the genetic factors of dairy type and milk production have been concentrated through generations of skilled breeding. Such a bull will thus be prepotent when mated with inferior cows and so impress his dominant characteristics on his offspring. There are, of course, exceptions to the rule, but averages clearly show the profounder influence of the production-lineage, purebred sire when mated with mixed-bred or grade herds. Conversely, the use of a grade bull, even if he be the progeny of a high-producing cow,

is always risky; the grade bull will not breed true. Likewise, a purebred bull from a low-producing cow will be unlikely to bring about increased production, even in a low-producing herd.

How Purity of Blood is Attained by Grading-up.

The introduction of a purebred bull in a scrub herd results in half-bred progeny. The next purebred bull leads to greater concentration of pure blood in the females sired by him, which may be classed as three-quarter grades. The third generation would be seven-eighth grades, the fourth generation fifteen-sixteenth grades, and so on. This method of improving a nondescript herd will lead step by step towards uniformity of type in each generation, and even as early as the third generation the cows will closely resemble purebreds.

What is the Productive Value of a Purebred Bull.

This will, of course, depend largely on the productive capacity of the bull and the productive level of the herd to which he is mated. If a purebred bull can increase the herd level by 20 lb. butter-fat per cow per annum on the same level of feeding, the increased return at 1s. 6d. per lb. for commercial butter amounts to £55 in a thirty-cow-herd. If this herd level be raised in the next generation by another 20 lb. per cow, the herd will return £110 more per annum than if a progressive policy of breeding had not been pursued. Of course, the most striking results in grading-up a herd must be expected in the first couple of generations; progress thereafter will be slower and bulls of sound production ancestry will be required to further raise the standard.

Other Factors in Herd Improvement.

It is axiomatic that economic dairy production is chiefly dependent on three factors—*feeding, breeding, weeding (or culling)*. These factors are interdependent. Merely to introduce a purebred bull into a herd will not alone suffice. In order to ensure that the cows in the herd will develop and yield to their inherited capacity and that, irrespective of seasonal conditions, production will be maintained, it is equally necessary to provide adequate food at all times. This in turn, focusses attention on the need for the provision of supplementary foods—such as hay, silage, and green fodder crops—to tide the herd over the recurring periods of pasture scarcity and drought. Furthermore, *culling* must be continuous to remove from the herd animals of poor constitution or low milk yield, which do not justify the time, expense, and feed required in keeping them, and replace them with better young stock.

VISIT TO THE NETHERBY STUD.

While at Warwick, the British Farmers' Delegation visited Mr. J. T. Scrymgeour's stud farm at Netherby. They were much impressed by the ability of this blind stud master. "It has been worth coming 12,000 miles to see such a complete triumph of spirit over a physical disability," the leader, Mr. Turner, declared, and added: "He knows the type of beast he wants and can go back in pedigrees for six and seven generations. His beef herd is the best we have seen in Australia and New Zealand. There is not a stud breeder who showed us more or told us more in less time than he did. We all feel we could not pay a higher tribute to him, and we mean every word of it."

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the Herd Books of the Ayrshire, Jersey, and Guernsey Societies, according to the rules laid down, and completed during the month of January, 1945 (271 days unless otherwise stated).

Name of Cow	Owner	Milk Production	Number Reg.	Sire
		Lb.		
AUSTRALIAN HOLSTEIN-FRIESIAN				
MATURE COW (STANDARD 550 LB.)				
Ash Vale Dora 4th	J. E. Heath, Margate	5,021·3	197,307	Norwich of Fairfield
SENIOR, 4 YEARS (STANDARD 330 LB.)				
Pontiac Princess 4th	M. J. Brosnan, Clifton	10,822·25	406,77	Springhill Valiant
SENIOR, 3 YEARS (STANDARD 290 LB.)				
Jamieson Marjorie 7th	M. J. Brosnan, Clifton	7,992·5	402,028	Springhill Valiant
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Robina Bess	D. Robinson, Warwick	7,396·75	288,945	Rosenthal Dorothy
SENIOR, 2 YEARS (STANDARD 250 LB.)				
Rosanna Perfect 10th	D. Robinson, Warwick	7,[illegible]·4	288,874	Rosenthal Perfection
JUNIOR, 2 YEARS (STANDARD 230 LB.)				
Poplar Flora Jean	W. H. Sanderson, Mitgeldie	7,368·05	295,774	Mount Farm King Billy
Bongaree Fancy Maid	J. C. Meier, Grandchester	6,702·4	277,248	Rosenvale Sensation
Northern View Jan. 4th 305 days	A. O'Sullivan, Greenmount	6,540·5	296,404	Sovereign Commander
Farmview Dora	W. Hemsnell, Yarranlea	5,886·64	295,712	Farmer Boy Bowen
JERSEY.				
SENIOR, 4 YEARS (STANDARD 330 LB.)				
Orangecliffe Cumming Floretta	J. Ahern, Cunnamulla	6,782·25	446,68	Orangecliffe Cumming Finian
SENIOR, 3 YEARS (STANDARD 290 LB.)				
Westbrook Agnes 7th 1946 days	Farm Home for Boys, Westbrook	12,146·4	327,178	Oxford Acres's Lad
Karta Daisy Jessamine	F. Edgar Petrie	7,359·45	378,483	Majestic Lad
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Westbrook Dale 11th	Farm Home, Westbrook	6,411·05	377,669	Westbrook Ambassador 30th
SENIOR, 2 YEARS (STANDARD 270 LB.)				
Westbrook Fern 14th	Farm Home, Westbrook	7,243·35	379,672	Delsey Royal Standard
Lochmoor Lily	J. Schnill, Oakey	6,021·15	351,266	Selsey Sonnets Hallmark
JUNIOR, 2 YEARS (STANDARD 230 LB.)				
Tivoarie Tiptop 7th	P. A. Schnill, Oakey	4,710·75	295,639	Tivoarie Super Duke
Ascot's Pastorell 2nd	P. A. Schnill, Oakey	4,916·2	244,719	Tivoarie Victor 4th
GUERNSEY.				
SENIOR, 2 YEARS (STANDARD 250 LB.)				
Linwood Starra	A. S. Cooke, Maleny	7,178·65	297,743	Warrawong Winter

Feeding Brood Sows.

E. J. SHELTON.

BROOD sows given a diet deficient in vitamin A not only produce litters with small reserves of strength but suckle them on milk of equal vitamin deficiency. The deathrate under these conditions is high, and, as at weaning the diet of the litter is changed to a diet similar to that of the mother, losses continue. The nutrition of breeding sows has, of course, a profound influence on their fertility and failure to come on heat after weaning is quite likely the result of insufficient nutriment. Research work in New Zealand has proved this. Four groups of sows were used; one was given pasture only from weaning to the next farrowing; another was allowed pasture only from weaning to six weeks before the next farrowing, when the sows were given 5 lb. of meal a day; another group was given 5 lb. of meal for six weeks after weaning and for six weeks before farrowing; and a fourth group was given 5 lb. of meal for six weeks after weaning and pasture only, until farrowing date.

It was found that the two groups which received meal for six weeks immediately after weaning, and so for the early part of pregnancy, produced the largest number of pigs born alive over three farrowings. This was not so much because of the size of the litters as to the fact that the sows left on pasture without other feed after weaning did not all come on heat, and this reduced the numbers of the litters in their group. This failure to come on heat lasted in some cases over several months, although pasture was plentiful. When these sows were later fed on grain for six weeks after weaning, they came on heat normally. It also was observed that the sows fed for six weeks before farrowing gave litters with higher birth weights, higher weights at three weeks of age, and higher weights at weaning, despite the fact that all the pigs were fed the same after farrowing. It was shown, therefore, that feeding before farrowing favourably affects litter weight and litter growth, despite improvement in feeding after farrowing.

These factors are coming more pronounced now that cereal grain, wheat, and grain sorghum in particular are being fed largely throughout the State. They were possibly not so evident when maize formed a large part of the grain diet, and there were fewer nutritional problems.

The Problem of Slow Growth.

Usually, the complaint is that "my pigs are not doing as well as they ought to although they are getting plenty of food." Pigs in that condition have a much lowered resistance to disease; they appear to

Plate 73.

LARGE WHITE BOAR OF A HIGHLY DESIRABLE TYPE.—Note length and evenness of body, masculine character, strength of leg and clean attractive coat.

readily develop "pants," a form of pneumonia which may be fatal. Sometimes there is a tendency for the animal to carry the head to one side and go round and round and so it has difficulty in getting to the food trough; this interference with the nervous system affects the eyesight and the movement of the legs, and in advanced cases partial paralysis may develop. There is a disease known as suppurative otitis, which develops as a result of abscess formation in the middle ear, and, doubtless, other parts of the body like the spine suffer, too.

Even animals which appear quite healthy are often slow growers because of deficiency in the diet.

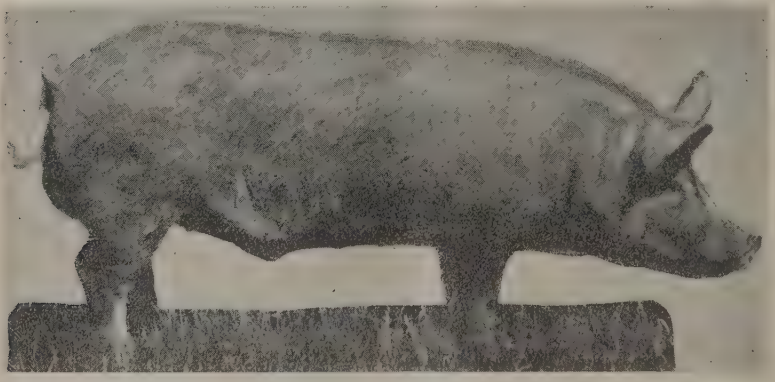


Plate 74.

CANADIAN TYPE BERKSHIRE BOAR OF A TYPE WHOSE LENGTH IS MUCH IN DEMAND.—Possibly somewhat coarse in skin but very robust. This boar should be ideally suited for mating with sows fine in skin and hair either pure, cross, or grade.

Plate 75.

Tamworth Boar of a Modern Type.—Fine in quality, but somewhat heavy in bone. In conformation even more length and less jowl would be desirable while the ham could be somewhat more compact.

Treatment.

Improvement in the methods of feeding and in the quality of the food is the first consideration, having in mind that prevention is better and more economic than cure. The vitamin deficiency must be made good before improvement can be looked for. The simplest method the farmer can adopt is to include green feed and sound root crops in the pigs' diet. The pig is by nature a grazing animal and as is indicated by the experiments referred to, brood sows can manage on a pasture diet with little other food during part of their gestation period; milk is, of course, a very satisfactory food, especially for sows and young pigs.

Specialists in animal nutrition emphasise that by feeding brood sows with foods rich in vitamin A the risk of sterility is obviated, physical reserves are built up, and the young, both before and after birth are assured of adequate protective vitamins so important in the first two months of their life.

Mineral Deficiencies.

In an article on this subject, Dr. M. White* stated that lime deficiency is becoming more marked since cheaper grain for feeding has outstripped supplies of skim milk and meat meal in balancing rations. Restricted supplies of lime-rich foods, together with increased allowances of cereals which contain the lime-robbing "phytin," has resulted in a marked drop in the calcium (lime) intake of pigs. The faster animals grow the greater the call for lime, and if this demand is not met a well-defined series of disorders may occur. The sows may farrow still-born pigs with so little vitality they may survive for only a few hours. Even pigs born alive may be unthrifty because of defective skeleton formation and because lime deficiency lowers milk production, so that growth also is retarded. Bone fractures also have been noted at bacon factories, and this is largely averted when grazing and ample legume

* Agricultural Chemist, Department of Agriculture and Stock, Queensland.

hay is provided and, if practicable, meat meal or separated milk. If these are in short supply, a lime supplement is necessary. These substances may consist of ground limestone, sterilized bone meal, or burnt bone, or aged wood ashes—particularly from hardwoods. Mixtures of any or all may be used. Gypsum also is a source of lime for pigs. Sows and growing pigs should have first call on what is available. Up to 1 lb. of mineral mixture to each 100 lb. (dry weight) of food may be given or, alternatively, a mixture of equal parts sterilized bone-powdered limestone and wood ashes with charcoal included, to which has been added about 10 per cent. of salt. Such mixture may be kept in a heavy, stout container to which the animals have free access.

PROFIT AND LOSS.

Going on the results of research in the United States, the following are among the more important factors influencing profit and loss in pig-breeding:—

Service.—40 gilts bred twice during heat produced 36 litters of 8·2 pigs; 43 gilts bred once produced 31 litters of 7·1 pigs.

Litter Size.—Litters of more than 10 at birth resulted in more weaners than smaller litters, but just as heavy.

Weaning Weight.—Weaners of 15–35 lb. gained 1·4 lb. a day to 6 months of age; while those of 35–50 lb. gained 1·5 lb. a day.

Sow Productivity.—A good sow weaned 10 pigs of 32 lb. each, which fed to 259 lb. in 6 months at a cost (including sow's rations from breeding to weaning) of 341 lb. of feed per 100 lb. of hog marketed. The same feed cost for pigs of medium sows was 448 lb.; and for pigs of poor sows rearing only 4 was 571 lb. Good sows produced 42 per cent. good female progeny; medium sows only 17·4 per cent.; and poor sows none.

Mastitis of one or more glands like inverted nipples was found in certain lines of breeding, suggesting an inherited susceptibility.*

Rearing ability is more dependent on external influences than is fertility. The prolificacy of the sow has a proportionate effect on the number born in each litter and selection could have been undertaken profitably after one, or preferably two, litters had been reared.

Of new-born pigs, 25 per cent. died during the suckling period of 56 days. The percentage increased from 18 in the first litter to 32 in the tenth; from none in litters of 2 and 3 to 60 in litters of 21 and 22. The number reared increased from 2 to 11, as the size of the litter increased from 2 to 17 then declined slightly to 9, as little size increased from 17 to 22. The average number of pigs in a litter was 11·04, and of pigs reared 8·29.

It is probable that with successive litters the number in the litter will increase, but the average weight of each piglet will remain almost constant. The increase in the productive capacity of the brood sow is thus according to increase in a number of offspring rather than in the size of the offspring.

In breeding experiments, it was found that the age of the sow at its first litter had no influence on the number of young born in either the first or second litters. Similarly, there was no definite evidence of the effect of this age on later fertility, although there was a slight tendency in favour of sows in the middle age group. —E.J.S.

* Bulletin, Missouri Agri. Exp. Stn. No. 461, 1943.

Dressing Poultry.

P. RUMBALL, Poultry Expert.

BECAUSE of the strict rationing of prepared poultry foods, many poultry keepers are faced with the necessity of reducing flock numbers; the following points on the slaughter and dressing of poultry are, therefore, of especial interest at the present time.

Killing.

Before slaughter the birds should be fasted for twenty-four hours, in order to facilitate drawing. Water, however, should be supplied. For local trade, killing may be done by removing the head with an axe, or by dislocating the neck. The latter method is very satisfactory and much cleaner, and is probably in more general use.

Dislocation of the neck is done by holding the legs and end of the wings in the left hand and grasping the head of the bird with the right hand, the thumb being behind the head and the second finger under the beak close to the throat. Next bend the head back almost at right angles and give a sharp pull with the right hand. This causes a dislocation of the neck where it joins the head, and severs the blood vessels. Stretch the neck slightly to create a cavity for the collection of the blood and hang the bird up until bleeding has finished, which will be indicated by an enlargement of the neck. Dislocating the neck of a bird at first may appear difficult, but by stretching the bird over the right hip one will soon acquire proficiency in the method.

For the export trade birds are generally killed by severing the jugular and debraining, as it is claimed that this method gives the best bleeding and that debraining facilitates the removal of the feathers when the birds are to be dry plucked.

Plucking.

There are four methods of plucking—dry plucking, scald, semi-scald, and wax plucking. Unless a person is very proficient, the dry method of plucking is laborious and slow, and for local trade is not essential; while for the wax method a fairly elaborate equipment is necessary.

Scald Method.

The water should be held at a temperature of 180 degrees Fahr. With this method it is essential to guard against the partial cooking

of the skin, which causes the bird to discolour rapidly and the skin to tear easily when the feathers are being removed. In scalding, the birds should be held by the head and feet and drawn through the water with the feathers and not against them in order to prevent the water penetrating to the skin. By this process the steam will reach the base of the feathers, and the length of time of scalding required judged by pulling a few of the thigh feathers.

After scalding, first pull the main tail and wing feathers and then start on the breast, then the small body feathers, taking care to avoid tearing the skin of the breast. When a bird has been properly scalded the feathers may almost be rubbed off. With a blunt knife any pin feathers left may be removed easily by grasping them between the thumb and the knife.

Semi-scald.

This is a method that has come into use in recent years, and it is claimed that the process has not the discolouring effect when the birds are kept in storage for any time, and that the finished bird is in appearance equal to that of the dry-plucked bird.

The temperature of the water used for the method is between 125 deg. and 130 deg. Fahr. The birds are immersed in this water from a quarter to half a minute. Picking the bird after being submitted to the semi-scald method is quicker than the dry picking method, and the pin feathers are easy to remove. The same plan of plucking is followed in this method as any other—*i.e.* the tail, wings, breast, &c.

After plucking, a considerable number of fine hairs will be left, which, for appearance sake, it is desirable to remove. Many dressers do this by singeing with lighted paper. This invariably causes an objectionable darkening of the skin, therefore it is better to pass the bird over a flame of a methylated spirit lamp.

Cooling.

To cool the carcase, do not lose sight of the keeping quality. Cooling as rapidly as possible is desirable, but if the birds are to be kept for any length of time they should be placed on racks in a store at a temperature of from 30 to 40 deg. Fahr.; whereas if they are to go into immediate consumption cold or iced water may be used.

Dressing.

Lay the bird on its breast and with a knife cut the skin at the back of the neck from the body to the head. Loosen the neck, gullet, windpipe, and crop from the skin. Then remove the neck by cutting it close up to the body. The crop and windpipe can then be pulled out and the neck skin then severed from the head. Then insert the index finger or a knife and break away all connective tissue.

Turn the bird around and make an incision between the vent and the tail, then with the index finger pick up through this opening a loop of the intestines and draw out. When out sufficiently, cut around the intestine and remove the vent. Remove the intestines, then gizzard, liver, heart, and lungs, all through this opening.

With the aged birds it is sometimes desirable to remove the sinews of the leg. This is easily done by cutting the skin around the shank about

½ in. from the hock; then break the leg of the bird close to the cut by bringing the leg sharply down on the edge of the table. The lower part of the shank and foot will then hang only by the sinews. The foot of the bird is then placed in a grip or hook, and by grasping the thigh in the hand, and giving a sharp pull, the sinews are torn out.

Trussing.

Draw the skin of the neck on to the back, locking it down by folding the wing tips under on to the shoulder. This closes effectively the cavity in the front of the bird and gives it a nice finished appearance. The "drum-sticks" may be tied down with string or skewers. Many, however, make a point of just holding them in place by drawing the skin of the abdomen where cut, over the ends.

FEEDING A HUNGRY WORLD.

The victories of our advancing armies give us all a thrill, and the people of Britain who have endured the blitz and blackout of six years of war at their very door with characteristic courage and dour determination will have the hope, with the thrill, that the long awaited day of relief is dawning. And with the thrill comes the realisation that every advance means more mouths to feed and to be kept fed, that every mile on the march to Berlin adds to our responsibilities as food producers.

It has been necessary to form two international bodies—one known as the Combine Food Board in Washington and the other the London Food Council—to attempt some sharing out of the available world food supplies in proportion to world food needs. The problems these bodies are facing this year and which will continue into next year and the year after that are immense.

In an article written by him on his return from Britain recently, Mr. W. Bankes Amery, leader of the United Kingdom Food Mission to Australia, describes the very serious food situation facing not only Britain but the whole world. He says that for nearly all food products the existing world demand, without counting civilian requirements of countries such as Poland, which still have to be organised, or the requirements of Norway, Denmark and Holland, which still have to be liberated, is immensely greater than the estimated production. Fortunately, in some commodities a bad season in one country is offset by a good season in another. The heavy decline in the production of wheat in Australia, for instance, is offset to some extent by a bumper crop in North America. As against our bad season for meat and dairy products is an unusually good season in New Zealand. The big problems in the Old Country this year is the keeping up of the rations to her own people, and, at the same time, giving all the food she can to the hungry people of Europe. Fortunately, too, France and Belgium are making an unexpected rapid recovery in food production for themselves, and that relieves the strain a bit, but even in peacetime both those countries were big importers of some of the major foodstuffs. Yet the needs—the crying needs—of other European countries remain. Then there is the problem of Asia, and of China particularly. The inhabitants of all the countries have to be fed if the world is to avoid another calamity.

There is widespread feeling of sympathy in Britain for the primary producers of Australia whose great efforts to maintain production as their contribution to war needs have been frustrated to a large extent by seasonal setbacks. It is abundantly clear, however, that for many years Britain will need all the meat and dairy products we can possibly send. That is why Britain has offered long-term contracts for the purchase of the whole of Australia's exportable surplus of those products. Australian producers are assured of firm markets for the commodities covered by the long-term agreements, and there need not be any anxiety as to the capacity of the world to pay for the harvest when it is ready.

GENERAL NOTES

Meat, Meal, and Wheat Offal Rationing.

Dairymen supplying milk for human consumption, and pig raisers should make application on Form M.104.A and all poultry keepers should apply on Form M.107 if they desire to purchase during June to September any of the rationed meals—blood, meat, meat and bone meals, bran and pollard or commercially prepared mashes. Applications definitely close on 7th April, 1945, and forms are available at all branches of the Department of Agriculture and Stock.

Dairy Board Chairman.

Mr. James Purcell (Toowoomba) has been appointed Chairman of the Dairy Products Stabilisation Board until 31st January, 1948.

Honey Board.

Regulations have been issued under the *Primary Producers' Organisation and Marketing Acts* empowering the Honey Board to make a levy on growers of honey and beeswax delivering such commodities to the board or its authorised agents; and on exempted growers at a rate not exceeding 3 per cent. of the gross proceeds of sale of all honey and beeswax. The proceeds from the levy will be used for administrative expenses of the board. The operation of previous regulations of a similar nature expired in March, 1944.

Other Fruits Sectional Group Committee.

An amendment of Regulations under the *Fruit Marketing Organisation Acts* provides for an increase in the number of members of The Other Fruits Sectional Group Committee of the Committee of Direction of Fruit Marketing from nine to ten, and makes provision for the holding of a ballot for the purpose of electing such additional member. The additional member will represent an electorate comprising fruit and vegetable growers in North Queensland, where vegetable growing has expanded under wartime conditions.

Veterinary Science Scholarships.

Following a scheme for the institution of veterinary science scholarships, as from the commencement of the 1945 university year, to provide for the recruitment of future appointees to the veterinary staff of the Department of Agriculture and Stock the Minister for Agriculture and Stock (Mr. T. L. Williams), has announced that three veterinary science scholarships have been allotted to Messrs. J. W. Ryley (Yeerongpilly), S. J. Miller (Tambo) and J. R. Folk (Blackall).

Mr. Ryley, who has completed his first year in science at the University of Queensland has been allotted a four-year scholarship, to commence his second year of the course at the Sydney University.

Messrs. Miller and Folk, who have passed the senior examination, have been allotted five-year scholarships, the first year of the course to be taken at the University of Queensland.

" For Ever Grateful."

"Australians in the hands of the Germans will for ever be grateful for the Red Cross parcels which arrived from time to time," says Padre Fairlie Forrest, of Horsham, Victoria. He has recently been repatriated from Germany.

The excellent food which the parcels contain have been a very great help, particularly to sick men and during the cold weather. The Germans have been very honest in their handling of parcels for British prisoners of war, and parcels which contain cigarettes, clothes and food have, from Padre Forrest's knowledge, been seldom touched by the Germans.

Rural Topics

British Farmers' Delegation in Queensland.

The British farmers' delegation arrived in Queensland like a rocket bomb and were back over the southern border before many had realised the historic importance of their visit, the breadth of vision behind it and the effect it may have in uniting Australian farmers and stock breeders. The delegation spent less than five full days in this State, yet in that brief time its members covered more than 800 miles of road travel. Its mission is to do everything possible to establish an international farmers' organisation to preserve the status of the food producing industries in the post-war world, particularly in relation to marketing organisation. The delegation consisted of young men mainly, and each has a record of unusual success as a farmer behind him. The leader of the delegation, Mr. James Turner, is the youngest president the National Farmers' Union of England and Wales has ever had. Other members include Messrs. S. O. Ratcliffe, a past president of the National Farmers' Union; William Young, the senior vice-president of the National Farmers' Union and of the Chamber of Agriculture of Scotland; George Ervine, the deputy president, formerly president of the Ulster Farmers' Union; Giles Tuker, the chairman of the Essex Associated Fruit Growers, the biggest fruit co-operative society in Britain.

While their stay in Queensland was so brief, there was no lagging by the way; it would be a mistake, however, to regard their tour was just a hurried rush from point to point. The tour was sponsored by the Primary Producers' Council of Australia. The president, Mr. R. C. Gibson, and Queensland members of the Council, including Messrs. P. Newcomen, J. Kennedy, and J. F. Meynink, and Mr. Ken Hack, of the Council of Agriculture, accompanied the delegation and discussed the progress and practice of rural industry in Queensland, and there was a wealth of wayside examples to give point to discussion, whether it was of stock, pasture, crops, organisation, or marketing.

The visitors were cordially welcomed to Queensland by the Minister for Agriculture and Stock, Hon. T. L. Williams, who placed the resources of his Department at their disposal and arranged for senior departmental officers to accompany them on a tour through the Kingaroy district and the Darling Downs.

Things to Come in Agriculture.

The leader of the United Kingdom Farmers' Delegation, Mr. James Turner, said in the course of an interview that primary production in Britain had been expanded tremendously during the war. This showed the productive capacity of the British agriculturist where he was given the opportunity of a guaranteed market and a stabilised price based on cost of production and efficiency. They were bound, for two reasons, to maintain the quantum of production after the war but production would be changed somewhat. They had had to concentrate on the maximum amount of food for direct home consumption such as wheat for bread, potatoes, which had been increased by 102 per cent., sugar beet, which now produced the white sugar ration in Britain, and milk, because milk had been given No. 1 priority on nutritional grounds. In order to do that they had to reduced the number of their livestock. Pigs had been reduced by 57 per cent., poultry by 34 per cent., sheep by 23 per cent., and beef cattle by a large percentage.

The problem after the war, Mr. Turner said, was to restore the balance as between stock and crop in order to maintain the national capital asset of production combined with fertility of the land. There would have to be adjustments. They had been able to maintain the animals they had by using home-produced feeding stuff. This had been achieved by a 50 per cent. increase of arable land as between plough and grass and in spite of a decrease in the total acreage of 600,000 acres, which had been lost to production because of war purposes, such as aerodromes, battle training schools and war factories.

This had been achieved by the industry exerting self-discipline through agricultural war committees that had been recruited from the ranks of the farmers themselves. Any control or authority that had been exercised over the farming community in Britain had been exercised by fellow farmers.

The Pre-war Food Policy.

When questioned as to what the imported food position in Britain after the war will be, Mr. Turner, leader of the British Farmers' Delegation, said that before the present war the political and economic policy of Britain was to have cheap food regardless of its real cost. He especially wanted the word real to be emphasised. This policy had resulted in a decrease in the purchasing power of the primary producers, not only in Britain, but in all the countries where the food that was sent to Britain originated. This had the effect of bringing in industrial unemployment and had lowered the household incomes in a large percentage of the homes in Britain in spite of the cheapness of the food. After the war the policy in Britain must be to maintain full productive employment of all their population and, therefore, to that extent the food which came from British agriculture must be supplemented by food from overseas. This was directly dependent on the purchasing power of their population which would follow full productive employment.

Before the war the British farmer produced 30 per cent. of the food that was consumed by the people of Britain and 70 per cent., therefore, was imported. There was in this importation very little orderliness. When British agriculture had been restored to its balanced production and full productive employment was attained, then it might well be that the quantum of production in Britain would be 66 per cent. The remaining 34 per cent. of its market could easily be equal to the 70 per cent. imported before the war when living standards and household incomes were so small.

Mr. Turner added that after the war, when restrictions now in force through rationing and war needs were removed, it was the intention of the British farmers to produce food for the consumers at the lowest price that was economically possible. The inter-dependence of agriculture in Britain and primary production in Australia and all food-producing countries in the Empire was evident, and the National Farmers' Union of England and Wales were convinced, as an organisation, that it was important that primary producers should have a fair return for their capital and labour without having to resort to any artificial means of bolstering up their industries or, in fact, without having to exploit the land. They were convinced that these could be best achieved by international co-operation and they hoped to lay the foundation for a permanent exchange of views on the problems of national and international marketing, scientific advance in the industry and new marketing potentialities through the machinery of an international federation of primary producers. Australia and New Zealand had already subscribed to this idea and would send delegates to a conference to be held in London in October.

Mr. Turner remarked further that there was an impression that London was the only market. There were other markets and they wanted to see the foundations laid for machinery which would ensure the better distribution of the world's food resources and thus prevent surpluses being in any place to constitute a menace when such surpluses should really be distributed where the greatest need existed.

Mr. Turner said he would like to emphasise that members of the delegation were a team of farmers who got their living from the land and were all practical farmers.

No Surplus Food While People are Hungry.

Members of the United Kingdom Farmers' Delegation have made it plain that there can be no surplus of food while the people of any country in the world are ill-fed or poorly clothed; that so-called surpluses are merely the result of maldistribution of the world's foodstuffs; and that international co-operation along the lines of the Hot Springs proposal for world food and agricultural organisation is the line of action most likely to serve all mankind and to ensure a lasting peace in the post-war world.

They have, however, warned the producers wherever they have gone that unplanned or haphazard expansion in production before the distributive machinery is ready to handle the products, or before there is the purchasing power to absorb them, would be foolhardy, as it would cause a devaluation of food, with its accompanying depression, and retard the early realisation of Hot Springs ideals.

Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

RADIANT MOTHERHOOD.

Importance of Exercise.

IN last month's article the outline for the general care and diet of the expectant mother was discussed, but there are some special points which need to be stressed. Pregnancy is not a disease of nine months' standing—it is a normal physiological condition which should not be associated with the idea of illness and so, when an expectant mother regards herself as an invalid, she has an entirely wrong point of view. Once the mother has attended her own doctor and has received assurance that everything is in order, she should regard herself as an athlete who has a race to run or some other special test to undergo and make herself as physically fit as possible. As we know, an athlete trains for his special test by avoiding excesses of any kind, by eating a well balanced diet and by exercising, and so an expectant mother must follow this example and put herself in training.

During pregnancy, a certain amount of strain is placed on some sets of muscles and, to ensure that baby is born without difficulty, several other sets of muscles need to be kept well-developed and supple. Backache is fairly common during pregnancy and a support is often worn to ease it. This should not occur—the best support a woman can have is a good set of abdominal muscles.

Because the stretching and reaching movements of sports—such as golf or tennis—are not advisable for most mothers, they must have something else to replace these, especially if the mothers have been accustomed to playing games regularly. Riding and cycling are usually best avoided, but swimming is an excellent exercise, provided the sea is not too rough. Gardening also can be an interest, as well as an exercise. Brisk walking in the open air in a pair of comfortable shoes is excellent, and the usual household tasks also are good, provided the lifting of heavy weights—such as large wet articles onto clothes lines—is avoided.

Moreover, special exercises can be performed regularly which will increase muscular tone and give the mother a sense of well-being. In some hospitals, both in Australia and overseas, the exercises are done in classes at the ante natal clinics and have proved very popular. The prospect of "radiant motherhood" shown by these young women laughing together as they swing their limbs in unison to the music of the gramophone is one of the happiest sights imaginable.

Many young expectant mothers cannot attend such classes, either because they are not available at their local hospital or because their domestic circumstances do not permit of it. These mothers may attend one of the metropolitan ante-natal clinics attached to this Service and be shown by the sister in charge how to do these exercises or may write for a printed set. If they have a gramophone, so much the better.

Next month, we shall tell mothers of other interesting occupations for the pre-natal period. In the meantime, for further information and advice regarding how to keep fit expectant mothers are invited to write to the Sister in Charge of the *Ante-natal Section of the Maternal and Child Welfare Service*, 184 St. Paul's Terrace, Brisbane, from whom also a copy of the booklet, *The Expectant Mother*, can be obtained. These letters may be addressed *Baby Clinic, Brisbane*, and need not be stamped.

IN THE FARM KITCHEN.

Variety Meats.

Spiced Lambs' Tongues.

Wash and cook 4 fresh lambs' tongues until tender, adding 1 teaspoon salt, 1-inch piece stick cinnamon, 1 small bay leaf, 3 whole cloves, 1 slice onion, and add about 3 tablespoons lemon juice when half done. Serve hot or cold. If served cold, cool the tongues in the stock, then chill and slice thin. Serves 6.

Pork Tongue with Tomato Sauce.

4 cooked tongues
1 cup tomatoes
1 onion
½ cup vinegar
1 tablespoon butter
1 teaspoon sugar
1 teaspoon salt
1 teaspoon cinnamon
Pepper

Place cooked tongues in casserole or heavy kettle. Prepare a sauce of the other ingredients and pour over them. Bake for 1 hour in a slow oven (300 degrees F.) or simmer on top of stove for 30 minutes. Serves 6.

Liver Loaf.

1 pound liver
2 tablespoons fat
1 onion
1 egg
1 teaspoon salt
1 cup milk
¾ cup bread crumbs

Brown the liver in the fat for about 3 minutes. Grind the liver and onion. Add salt and crumbs, and moisten with egg and milk. Mix well and turn into a buttered baking dish. Bake ¾ hour in a moderate oven (350 degrees F.). Serve with or without tomato sauce. Serves 6.

Casserole of Liver with Vegetables.

1 pound liver, sliced
2 tablespoons bacon drippings
1 cup small onions
2 cups carrots, cut
2 tablespoons flour
1 quart potatoes (cut in large dice)
1 tablespoon celery tops
2 teaspoons salt
Pepper

Wash and pare the vegetables, then boil in a small amount of hot water for 10 minutes. Put the vegetables and the liquid into a baking dish or casserole. Cover with liver prepared as follows: Remove skin and veins from the liver and cut into conveniently sized pieces; sprinkle with salt, pepper, and flour; put into a hot pan with the fat, and sear quickly. Cover the dish and bake for 1 hour. Serve in the casserole. This recipe may also be cooked on the top of the stove simmering for 1 hour. Serves 6.

Liver Sandwiches.

1 cup ground liver, cooked
2 tablespoons catsup
2 tablespoons cabbage, chopped
2 tablespoons butter
Few drops onion juice
Salt, Pepper

Mash or grind cooked liver. Mix with butter and seasonings. Use as a spread for sandwiches. Store in a jar in the refrigerator.

Baked Liver in Sour Cream.

1½ pounds liver (one piece)
⅛ pound salt pork
1 cup sour cream
1 teaspoon salt
Pepper

Beef, lamb, or pork liver may be used equally well. Cut salt pork into small strips and insert them in top surface of liver. Marinate liver for ½ hour in 3 tablespoons of French dressing, turning a few times. Place liver in a casserole, and add salt and pepper. Pour the sour cream over it and bake in a moderate oven (350 degrees F.) until tender. It will require about 1½ hours for lamb liver and 2 hours for beef or pork. Serves 6.

Liver Cutlets.

1 pound liver
2 tablespoons fat
½ teaspoon salt
1 cup tomatoes
2 tablespoons flour

Cut the liver into cutlet shaped pieces. Dip in flour and brown lightly in the fat. Add salt and tomatoes, cover and cook slowly about 20 minutes or until tender.

Creamed Sweetbreads on Toast.

2 pairs sweetbreads or brains
2 tablespoons butter
2 tablespoons flour
¼ teaspoon salt
1 cup milk
6 slices toast

Wash sweetbreads and parboil for 10 to 15 minutes in salted water to which 2 tablespoons vinegar has been added. Drain and break apart, removing membrane, Prepare a white sauce of butter, flour, salt and milk. Boil 1 minute, add sweetbreads, reheat and serve on hot toast, split hot biscuits, or in individual pastry shells.

Variation:

1 cup parboiled celery or cooked carrot, diced, may be added.

Sweetbreads or Brains Breaded.

Wash thoroughly the sweetbreads, or wash and remove the undesirable membrane and blood vessels from the brains, and marinate overnight in the following dressing:

¼ cup salad oil
2 tablespoons vinegar
¼ teaspoon salt
Pepper

In the morning, remove the meat, let drain a moment, drop into beaten egg, roll in fine crumbs and fry in hot fat 10 minutes. The oil may be skimmed from the dressing and used to fry the glands.

Tripe Pepper Pot.

1 pound boiled tripe
½ pound shin of beef
2 cups diced raw potatoes
1 cup diced carrots
¼ cup finely cut onion
2 cups dumplings
2 teaspoons salt
⅛ teaspoon pepper
1 tablespoon finely cut parsley or celery leaves
1 tablespoon dried sweet marjoram

Add the beef shin to two quarts of cold water; boil for 1 hour and add the tripe, which has been cut into half-inch dice; add the carrot, potato and onion and one quart of vegetable stock on hand. If there is no vegetable stock use water. Boil for 35 minutes or until the vegetables are tender; add the seasoning, the flavouring and the dumplings, which have been liberally sprinkled with flour. Boil from 8 to 10 minutes.

The dumplings are made as follows: Sift 1 cupful of flour, 1½ teaspoonfuls of baking powder, and a quarter of a teaspoonful of salt into a bowl; add enough cold milk to hold them together. Sprinkle the board with flour and roll out the dough a quarter of an inch thick and, with a knife, cut it into quarter-inch strips; cut crosswise again, making the dumplings, before boiling, a quarter of an inch square.

ASTRONOMICAL DATA FOR QUEENSLAND.

APRIL.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.57	5.47	Cairns	19	38	Longreach ..	31	39
6	6.00	5.41	Charleville ..	26	28	Quilpie	36	34
11	6.02	5.36	Cloncurry ..	44	56	Rockhampton ..	6	14
16	6.05	5.30	Cunnamulla ..	30	29	Roma	16	18
21	6.08	5.26	Dirranbandi ..	20	18	Townsville.. ..	18	33
26	6.10	5.21	Emerald	15	23	Winton	35	45
30	6.12	5.18	Hughenden ..	29	41	Warwick	4	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	p.m.	a.m.
1	8.01	8.37
2	8.38	9.30
3	9.19	10.24
4	10.06	11.19
		p.m.
5	10.57	12.14
6	11.54	1.08
7	..	1.59
	a.m.	
8	12.55	2.47
9	1.59	3.33
10	3.04	4.16
11	4.11	4.57
12	5.19	5.39
13	6.27	6.21
14	7.35	7.05
15	8.43	7.52
16	9.50	8.43
17	10.53	9.37
18	11.51	10.32
	p.m.	
19	12.44	11.29
20	1.30	..
		a.m.
21	2.12	12.25
22	2.49	1.20
23	3.23	2.14
24	3.55	3.06
25	4.25	3.57
26	4.56	4.49
27	5 28	5.40
28	6.01	6·32
29	6.38	7.25
30	7.18	8.20

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICT).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	24	14	41	30	16	5	47	34
6	28	11	44	26	19	1	51	29
11	19	18	35	34	10	9	40	38
16	12	27	27	43	2	18	30	51
21	13	26	28	42	3	18	32	50
26	20	19	37	34	11	10	42	39
30	27	13	43	28	18	2	50	31

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	42	16	58	42	43	27	35	16
3	48	10	63	38	47	23	39	11
5	51	6	65	35	49	21	42	8
7	48	8	63	36	47	22	39	9
9	44	15	60	41	45	26	36	15
11	29	26	50	47	35	33	25	22
13	23	37	46	56	31	41	21	32
15	13	45	39	60	24	46	13	37
17	8	50	37	63	21	49	8	42
19	8	49	37	63	21	49	8	41
21	13	46	39	61	24	47	13	38
23	19	40	44	57	29	42	18	34
25	29	32	50	52	35	37	25	27
27	37	22	55	45	40	30	31	20
30	48	10	63	38	47	23	39	11

PHASES OF THE MOON.

Last Quarter April 6th, 5.18 a.m.; New Moon April 12th, 10.29 p.m.; First Quarter April 19th, 5.46 p.m.; Full Moon April 27th, 8.33 p.m.

DISCUSSION.

On April 16th the Sun rises and sets 10 degrees north of true east and true west respectively.

On April 11th and 25th the Moon rises true east.

Venus.—At the beginning of the month, close to Hamel, in the constellation of Aries, Venus sets a little later than sunset, 20 degrees north of true west. On the 15th it is in line with the Sun and rises at sunrise and sets at sunset. By the end of the month it will be visible low in the east in the morning twilight rising 10 degrees north of true east in the constellation of Pisces.

Mars.—In the constellation of Aquarius, this planet, at the beginning of the month rises soon after 3 a.m., 10 degrees south of true east. By the end of the month it will reach the constellation of Pisces and rise 2 degrees south of true east.

Jupiter.—At the beginning of the month Jupiter, in the constellation of Leo, will rise just before sunset and will be a brilliant object in the east during early twilight. By the end of the month it will rise during mid-afternoon, setting about 3 a.m., 6 degrees north of true west.

Saturn.—In the constellation of Gemini, Saturn sets just before midnight, 24 degrees north of true west. At the end of the month it sets during the early evening.

THE ECLIPTIC AND THE SEASONS.

Last month it was shown that the apparent path of the Sun from one constellation to another was not due to any movement of the Sun itself, but to the Earth's revolution round the Sun. From the illustration it should have been noticed, too, that the Sun always appeared in the direction of objects on a level with the top of the table. In reality also, the path which the Sun appears to trace out among the stars remains practically the same—always among stars in the plane of the Earth's orbit, and, since eclipses of the Sun and Moon occur only along this path in the sky, it was called the ecliptic. Now, if the Earth moved round the Sun with its poles perpendicular to the plane of its orbit (in the illustration of last month, with the stick through the orange placed in an upright position) there would be no change of seasons and the Sun would always shine directly over the equator. The poles of the Earth, however, are tilted about 66½ degrees from the plane of the Earth's orbit or about 23½ degrees from the perpendicular to the orbit. Thus, the equator is inclined about 23½ degrees to the Earth's orbital plane, and only twice in each revolution round the Sun does the Sun shine directly over the equator, the points at which this occurs being where the ecliptic and equator cross, and are called the equinoctial points. Over 3,700 years ago, at one of the equinoctial points the Sun appeared in the constellation of Aries and this point became known as the "first point of Aries." Since that time, however, because of the precession of the equinoxes, the point where the equator and ecliptic cross has gradually moved through Aries into the next constellation, Pisces; but although the Sun at this equinoctial point now appears in the constellation of Pisces, the term "first point of Aries" is still used.

QUEENSLAND WEATHER IN FEBRUARY.

Heavy to flood rains occurred in the North Coast, Herbert and Barron areas. Ingham reported a record daily fall of 1,890 points on the 2nd, and Innisfail and Babinda recorded 4,488 and 4,898 points respectively for the month. These falls were mostly due to the local rain cyclone at the beginning of the month. The Central Coast, Central Highlands and Lowlands sections showed deficiencies ranging from 36 per cent. in the Central Coast East to 48 per cent. in the Lowlands and require normal March distribution. Variable thunderstorms plus, late in the month, monsoonal falls brought fair to locally good over average totals in the Peninsula, Carpentaria and Upper West Divisions. These falls were deficient in the Lower West and South-west, but over the greater part of the South-east quarter variable district rains aggregating from 1 per cent. above in the Port Curtis to 188 per cent. above in the Western Downs were most opportune, especially in the Warrego and Maranoa where the averages were 228 and 328 points. Downs and South Coastal dairying and agricultural areas have now had good rains, especially sections of the former where local flooding and general stream rises were reported. Improvement in several inland pastoral areas would follow the series of February variable thunderstorms, but an early follow-up series of one or two general soaking monsoonal rains would be welcomed to ensure pasture growth and water supply during the normal drier Winter and Spring period.

Temperatures.—Maximum and minimum readings above normal, former nearly 6 degrees at Longreach, Rockhampton, Mitchell, and latter 3.4 degrees Longreach, 3.7 degrees Mitchell: Longreach 17 days over 100 degrees (110 degrees 16th).

Dust haze and local duststorm periods mostly in the South-west quarter and parts Central 1st/3rd, 12/17th and 28th.

Abnormal number of afternoon and evening thunderstorms in the South-east. Some local damage chiefly 11th/15th. Two lives lost 11th/15th.

Rainfall.—1,077 points on 15 days (average 618 on 13 days). Highest February total since 1934 (1,616 points). Local thunderstorms afternoon or evening from 11th to 21st except 13th, 16th, and 20th.

The rain position is summarised below—

Division.	Normal Mean.	Mean February 1945.	Departure from Normal.
	Points	Points.	Per cent.
Peninsula North	1,308	937	28 below
Peninsula South	896	1,043	16 above
Lower Carpentaria	617	621	1 "
Upper Carpentaria	556	439	21 below
North Coast, Barron	1,288	1,972	53 above
North Coast, Herbert	1,477	2,303	56 "
Central Coast, East	792	503	36 below
Central Coast, West	475	251	47 "
Central Highlands	351	186	47 "
Central Lowlands	310	160	48 "
Upper Western	304	287	6 "
Lower Western	195	102	48 "
South Coast, Port Curtis	576	580	1 above
South Coast, Moreton	658	825	25 "
Darling Downs East	304	511	68 "
Darling Downs West	233	670	188 "
Maranoa	282	328	16 "
Warrego	209	228	9 "
Far South-West	165	136	18 below

Commonwealth Meteorological Bureau, Brisbane.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JANUARY RAINFALL.

(Compiled from Telegraphic Reports).

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of years' records.	Jan. 1944.	Jan. 1945.		Jan.	No. of years' records.	Jan. 1944.	Jan. 1945.
	In.		In.	In.		In.		In.	In.
North Coast.					*South Coast—contd.*				
Atherton	11·36	43	5·04	15·22	Gatton College	4·32	44	4·06	3·62
Cairns	16·27	62	4·82	23·22	Gayndah	4·69	73	5·81	5·34
Cardwell	16·86	72	4·63	13·29	Gympie	6·55	74	8·90	6·31
Cooktown	14·00	68	19·67	19·66	Kilkivan	5·61	63	5·51	5·34
Herberton	9·34	58	3·47	11·74	Maryborough	6·96	73	7·11	7·97
Ingham	15·78	52	12·00	8·97	Nambour	9·32	48	16·67	4·74
Innisfail	20·24	62	4·08	26·14	Nanango	4·62	62	3·80	4·29
Mossman	18·26	20	15·67	22·41	Rockhampton	7·37	73	2·61	2·33
Townsville	10·94	24	3·67	2·87	Woodford	7·60	57	11·25	5·75
Central Coast.					*Central Highlands.*				
Ayr	10·82	57	7·69	4·12	Clermont	4·98	73	1·48	3·55
Bowen	9·63	73	3·06	4·02	Springsure	4·18	75	2·25	1·55
Charters Towers	5·30	62	1·50	3·48					
Mackay	13·59	73	7·73	3·37	*Darling Downs.*				
Proserpine	14·96	41	8·68	5·98	Dalby	3·42	74	4·63	3·84
St. Lawrence	8·94	73	3·12	3·24	Emu Vale	3·22	48	4·89	3·72
					Jimbour	3·50	65	2·25	2·45
South Coast.					Miles	3·85	59	3·71	2·04
Biggenden	5·28	45	3·38	3·63	Stanthorpe	3·66	71	5·20	2·30
Bundaberg	8·58	61	8·71	4·91	Toowoomba	5·15	72	5·78	5·03
Brisbane Bureau	6·34	93	4·74	2·63	Warwick	3·56	79	6·91	5·03
Caboolture	7·91	68	14·08	4·74					
Childers	7·27	49	6·64	3·38	*Maranoa.*				
Crohamhurst	11·78	50	15·47	3·72	Roma	3·23	70	0·47	2·19
Esk	5·61	57	4·57	3·56	St. George	2·68	63	0·91	2·10

CLIMATOLOGICAL TABLE FOR JANUARY.

Compiled from Telegraphic Reports.

Divisions and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cairns	..	87	74	91	5, 6, 7, 8, 15	69	25	2,322	17
Herberton	..	80	65	91	13	54	1	1,174	19
Townsville	..	99	75	97	6	63	7	287	8
Brisbane	29·94	85	69	89	1	65	10	263	10
Darling Downs.									
Dalby	..	89	65	95	10, 11	60	23	384	8
Stanthorpe	..	85	61	93	26	54	23	230	9
Toowoomba	..	82	61	90	11	57	7, 18	503	7
Mid-Interior.									
Georgetown	29·78	97	74	106	7	69	25	404	7
Longreach	29·81	99	74	110	7	65	4, 22, 23	102	4
Mitchell	29·79	95	65	106	29	54	23, 24, 25	109	4
Western.									
Burketown	..	95	76	105	4	71	8, 17	675	8
Boulia	29·73	98	74	108	7	64	22, 24	109	3
Thargomindah	29·77	97	71	110	6	61	2, 13	18	2

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